Using American Community Survey Data to Expand Access to the School Meals Programs

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Panel on Estimating Children Eligible for School Nutrition Programs
Using the American Community Survey

Allen L. Schirm and Nancy J. Kirkendall, *Editors*

Committee on National Statistics

Division of Behavioral and Social Sciences and Education

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PANEL ON ESTIMATING CHILDREN ELIGIBLE FOR SCHOOL NUTRITION PROGRAMS USING THE AMERICAN COMMUNITY SURVEY

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Special thanks go as well to Salvatore Saporito, Stuart Hamilton, and Ashwini Wakchaure of the College of William and Mary and the School Attendance Boundary Information System (SABINS) project for participating regularly in the panel's open meetings; making presentations concerning the SABINS project and its progress; offering general advice concerning geographic issues; and, most important, creating the files containing boundary information for all schools in our case study districts in the form needed by the Census Bureau.

In the process of preparing this report, the panel convened 10 meetings, 6 of them open meetings to benefit from presentations by many individuals. We would like to express our thanks for presentations concerning the school meals programs and administrative data by John Endahl, Ed Harper, Jay Hirschman, Cindy Long, Melissa Rothstein, Gary Vessels, and William Wagoner, FNS, and Christopher Logan of Abt Associates; presentations concerning the ACS, SAIPE, and geographic issues by Mark Asiala, Wes Basel, Douglas Geverdt, Todd Hughes, David Johnson, Donald Lurey, Alfredo Navarro, David Powers, Michael Ratcliffe, and Sharon Stern of the Census Bureau; a presentation concerning measurement of income and program participation by John Czajka, Mathematica Policy Research; a presentation concerning income variability and its impact on eligibility for school meals by Constance Newman, Economic Research Service, U.S. Department of Agriculture; a presentation concerning the Access, Participation, Eligibility, and Certification Study by Michael Ponza, Mathematica Policy Research; and a presentation concerning relevant U.S. Government Accountability Office (GAO) studies addressing the school meals programs by Kay Brown, GAO. The panel would also like to express its appreciation to the staff of the National Center for Education Statistics for attending panel meetings, describing their data and the quality of those data, and facilitating our collaboration with the Census Bureau.

The panel's final open meeting, held on March 3 and 4, 2011, was a workshop with school food service authority directors from our case study districts and selected other individuals from the school food community with insights to offer about Provisions 2 or 3 and the school meals programs more generally. The purpose of the workshop was to help us better understand issues pertaining to a potential new provision of the school meals programs, as well as the information school dis-

Finally, we recognize the many federal agencies that support the Committee on National Statistics directly and through a grant from the National Science Foundation. Without their support and their commitment to improving the national statistical system, the work that served as the basis for this report would not have been possible.

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Allen L. Schirm, *Chair*
Panel on Estimating Children Eligible for
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Summary

The National School Lunch and School Breakfast Programs, administered by the Food and Nutrition Service (FNS) of the U.S. Department of Agriculture (USDA), are key components of the nation's food security safety net, providing free or low-cost meals to millions of schoolchildren each day. To qualify their children each year for free or reduced-price meals, many families must submit applications that school officials distribute and review. To reduce this burden on families and schools and to encourage more children to partake of nutritious meals, USDA regulations allow school districts to operate their meals programs under special provisions that eliminate the application process and other administrative procedures in exchange for providing free meals to *all* students enrolled in one or more schools in a district. Because districts must use nonfederal funds to make up any difference between their costs and the reimbursement from USDA, the special provisions are most attractive for schools with high percentages of students eligible for free or reduced-price meals.

Under the most commonly adopted provisions, USDA reimburses districts for meals served on the basis of data collected through applications in a "base year." After 3 or 4 years, unless districts can show that socioeconomic conditions have not improved, they must take applications again to establish new base-year data that reflect the changes in conditions. The need to reestablish a base year is challenging. After not taking applications for several years, schools can lose institutional knowledge and find it difficult to process applications, while families may

resent completing what appears to be a new form when their children are already receiving free meals at school. As an alternative, a periodic survey of a sample of families with enrolled students could provide updated socioeconomic information for determining reimbursements, and would be less burdensome than annual applications. For most districts, however, collecting high-quality data at an affordable cost through a local survey could be a substantial challenge.

A special provision that would incorporate new data reflecting changes in local conditions without requiring applications to be taken or a special survey to be conducted every few years would be attractive to school districts and families: it would further reduce burden and could potentially increase the numbers of students who partake of school meals by expanding their access to free meals. To this end, FNS asked the National Academies' Committee on National Statistics and the Institute of Medicine's Food and Nutrition Board to convene a panel of experts to investigate the technical and operational feasibility of using data from the continuous American Community Survey (ACS) to estimate students eligible for free and reduced-price meals for schools and school districts. The ACS eligibility estimates would be used to develop "claiming percentages" that, if sufficiently accurate, would determine the USDA reimbursements to districts for schools that provided free meals to all students under a new special provision that eliminated the ongoing base-year requirements of current provisions.

The ACS is a natural source of data for deriving such eligibility estimates. As the replacement for the long-form sample of the decennial census, the ACS is designed to produce relatively precise estimates throughout the nation for small geographic areas, such as school districts, by surveying large samples of households and accumulating data over periods of 1, 3, and 5 years, depending on an area's population. Since becoming fully operational in 2005 (2006 for residents of group quarters), the ACS samples each month about 240,000 housing unit addresses, a target that was increased to 295,000 in June 2011. No other national household sample survey is nearly as large. The U.S. Census Bureau conducts the ACS and achieves high overall response rates of 97 to 98 percent. Collecting information on households and their members—including household composition, school attendance and educational attainment, income, participation in government assistance programs, and other characteristics—the ACS provides data for constructing estimates of total enrollment and students eligible for free and reduced-price meals for schools and school districts. The panel examined alternative procedures for constructing such estimates, provided the Census Bureau with a set of specifications, and evaluated the resulting estimates.

The panel conducted this study in two phases. It first issued an

interim report (National Research Council, 2010), describing its planned approach for assessing the utility of ACS-based estimates for a special provision to expand access to free school meals. This, the panel's final report, presents the panel's findings and recommendations and concludes the second phase of the study. The bottom line is a glass half-empty and half-full story. The half-empty part is the panel's conclusion that there is no immediately obtainable and usable set of estimates from the ACS that would enable USDA to specify a new special provision eliminating periodic base-year applications in all of the schools or entire districts that want to provide free meals to all students. The glass half-full part is that the panel developed a set of procedures through which an assessment by a school district could lead USDA to approve the use of ACS-based claiming percentages for some or all of the district's schools.

The panel's initial goal was to identify a universally applicable method for estimating ACS-based claiming percentages that could be used in any school district operating under a new special provision. The panel anticipated that one or more simple adjustments might be needed to account for consistent differences between ACS-based estimates and those from the traditional certification process of the school meals programs.

However, the panel's comparison of ACS estimates with administrative data for all school districts and for all schools in five case study districts revealed that the ACS generally understates the percentages of students eligible for free meals and overstates the percentages eligible for reduced-price and full-price meals, particularly in schools and districts with high percentages of students eligible for free and reduced-price meals. More important, the systematic differences observed vary substantially across schools and districts. In Norfolk, Virginia, for example, the differences between ACS estimates and administrative data are small, whereas in Pajaro Valley, California, the differences are quite large.

Several major factors appear to contribute to such systematic differences in varying degrees in different places: underreporting of Supplemental Nutrition Assistance Program (formerly Food Stamp Program) participation by ACS respondents, use of annual income in the ACS to determine eligibility rather than monthly income as in the application process, limitations of using ACS data to count migrant and other students who do not live in traditional housing or do not live in the district all year, the presence of charter schools and other school choice opportunities that draw students from their neighborhood schools and the districts in which they reside, and errors in the certification process. The variation in differences between ACS and administrative estimates illustrated by Norfolk and Pajaro Valley demonstrates that a one-size-fits-all approach to correcting for the effects of these and other factors will not work.

Accordingly, the panel suggests a more tailored approach to using

ACS estimates in a new ACS Eligibility Option (AEO). Essentially, an interested district would examine its annual ACS eligibility percentages to determine whether they were sufficiently close to the district's own certification percentages or, at least, differed in a consistent way from year to year. Should a district such as Norfolk, where the ACS eligibility percentages are consistently quite close to district-level data, determine that it was economically feasible to implement the AEO districtwide or for a group of schools, the district could apply for and USDA could approve the district's adoption of the AEO. In a district such as Norfolk, the AEO could be implemented with no correction or only a small correction for the differences between ACS and administrative estimates and with an adjustment to reflect the different expected participation rates of students in the free, reduced-price, and full-price categories when all students were offered free meals.

A district where there were substantial differences between ACS eligibility percentages and district certification data would need several years of ACS and administrative data to demonstrate the stability of a correction for such systematic differences. If such stability were found, the district could apply for a version of the AEO that would correct for the differences by benchmarking the ACS estimates to the administrative data. The district could operate an "AEO base year" to provide sufficient data to establish the benchmarking correction and incorporate the effects of the anticipated increase in participation due to offering free meals to all students. For any district that adopted the AEO, the annual release of ACS estimates would allow the district's AEO reimbursement claiming percentages to be updated each year to reflect the changes in socioeconomic and demographic conditions that are captured by the ACS. Nonetheless, districts could opt out at any time.

Because consideration of the AEO raises complex issues and the resources available to address such issues are limited, school districts will undoubtedly encounter technical and other challenges in assessing whether to adopt the AEO and in implementing it if the assessment is favorable. Recognizing these challenges, the panel offers a set of recommendations to facilitate districts' assessment and implementation of the AEO and to potentially improve the accuracy of school meals program eligibility estimates based on the ACS.

One such recommendation is that FNS provide technical assistance to states and districts, including the development and provision of a web-based "AEO Calculator" for use by districts in working with ACS estimates to assess and implement the AEO. The panel also recommends the designation and supplemental funding of early implementers of the AEO as demonstration sites and the commissioning of an independent

evaluation to enhance understanding of the effects of adopting the AEO, including, especially, the effects on participation and administrative costs.

The panel's recommendations also are designed to facilitate implementation of the AEO by removing specific barriers to its adoption. Because National School Lunch Program certification data are used to confer benefits for and administer other assistance and education programs, some districts have been reluctant to adopt existing special provisions that eliminate—for at least several years—the certification process and, thereby, certification data. These needs of other programs might also be a barrier to adoption of the AEO, which permanently ends the certification process. Therefore, the panel recommends that FNS, the U.S. Department of Education, and other federal, state, and local agencies agree to allow school districts to use data other than traditional National School Lunch Program certification data for individual and aggregate reporting of economically disadvantaged students under the Elementary and Secondary Education Act, as well as for other purposes.

In considering the AEO, some districts may wish to adopt it in a subset of schools with especially high concentrations of students eligible for free or reduced-price meals rather than districtwide. For such districts, the panel recommends that FNS and the Census Bureau agree on protocols and schedules for the exchange of school attendance area boundary information and the dissemination of ACS estimates, and that FNS provide technical assistance for the preparation of the geographic information needed by the Census Bureau.

Additional recommendations by the panel address activities to monitor and enhance the accuracy of the ACS eligibility estimates that would be used to implement the AEO. Specifically, the panel recommends collaboration among FNS, the U.S. Department of Education, and the broader education research community in monitoring the prevalence of school choice opportunities and evaluating the effects of such opportunities on the accuracy of ACS eligibility estimates; monitoring by FNS of the accuracy of ACS eligibility estimates, the accuracy of administrative certification estimates, and the accuracy and stability of differences between the ACS and administrative estimates; sponsorship of research to develop a statistical model that could be applied to all districts in adjusting for differences between ACS eligibility estimates and school meals program certification data; and collaboration between FNS and the Census Bureau to improve the methods for deriving ACS eligibility estimates, with a focus on methods for small-area model-based estimation.

Although these recommendations and those pertaining to technical assistance and related activities are appropriate for FNS to pursue if it chooses to implement the AEO, the panel developed other recommen-

dations that should be considered even if the AEO is not implemented. These recommendations address some of the challenges associated with survey and administrative data that the panel encountered in conducting its analyses.

One set of recommendations entails research activities that could improve ACS estimates for all uses, particularly those that require estimating whether low-income individuals are eligible for benefits under various assistance programs, such as the school meals programs. In addition to research to assess the quality of the panel's definition of "economic unit" for use in determining eligibility for free and reduced-price meals with the ACS, the panel recommends that the policy research community and the Census Bureau continue to investigate the causes of and solutions for not only the underreporting of income and program benefits, but also the differences in program eligibility estimates based on monthly and annual income.

Another set of recommendations entails research and other activities by FNS, the Census Bureau, and the National Center for Education Statistics that would improve the quality and availability of data pertaining to the school meals programs. These recommendations include annual production and dissemination of district-level ACS estimates of total enrollment and percentages of students eligible for free and reduced-price meals according to the panel's specifications (as revised based on further research); improvements in the quality and comparability of administrative data on enrollment and certification in the school meals programs; improvements in the quality, comparability, and availability of administrative data on participation in the school meals programs; and a feasibility assessment of developing a program for the periodic collection of data on the administrative costs of operating the school meals programs.

This report presents and describes in detail the panel's analyses and findings; the AEO developed by the panel; and the panel's recommendations for facilitating implementation of the AEO, improving the accuracy of ACS estimates of eligibility for the school meals programs, and enhancing the quality and availability of survey and administrative data for a broad range of uses. If implemented, the AEO would provide an opportunity to expand access to free meals for the nation's schoolchildren and reduce administrative burden on schools and families.

1

Introduction

The National School Lunch Program (NSLP) and the School Breakfast Program (SBP) are federally assisted meal programs operating in public and nonprofit private schools and residential child care institutions. The programs are intended to provide nutritionally balanced, free or low-cost lunches and breakfasts to students each school day. They are key components of the nation's food security safety net, serving tens of millions of children who might otherwise not obtain adequate nutrition.[1]

The Food and Nutrition Service (FNS) of the U.S. Department of Agriculture (USDA) administers both programs at the federal level. At the state level, the programs usually are administered by state education agencies, which operate them through agreements with local education agencies (LEAs), commonly known as school districts.[2]

Certification of students' eligibility for free or reduced-price meals on the basis of need has historically involved substantial paperwork and

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[1]This chapter draws heavily on Chapter 1 of the panel's interim report (National Research Council, 2010).

[2]"The term 'school food authority' (SFA) is used for local agencies administering the school meal programs (i.e., the governing body which is responsible for the administration of one or more schools and has the legal authority to operate the school meals programs in those schools), while the term 'local educational agency' (LEA) is used for those responsible for the application, certification, and verification activities of the NSLP, and SBP" (U.S. Department of Agriculture/Food and Nutrition Service, 2011b:2). Because the vast majority of participating schools are part of school districts, we use the term "school district" throughout this report to refer to local entities that enter into agreements with state agencies to operate the NSLP and SBP.

administrative burden for schools and families. To ease the administrative burden and expand the reach of the school meals programs, since 1980 USDA regulations have allowed school districts to use special provisions for determining federal reimbursement for meals served in one or more schools in a district. Under two such special provisions, Provision 2 and Provision 3 (discussed further below), the district provides free meals to *all* students in the participating schools (supplementing federal funds with local funds) while taking applications at most every 4 years. Three new special provisions for providing universal free meals were authorized in the Healthy, Hunger-Free Kids Act of 2010. The first, the Community Eligibility Option (CEO), will be permitted in schools, groups of schools, or school districts that identify at least 40 percent of students as being categorically eligible for free meals. Such identification is either through direct certification of students whose families are on lists of participants in the Supplemental Nutrition Assistance Program (SNAP, formerly the Food Stamp Program), the Temporary Assistance to Needy Families (TANF) Program, or the Food Distribution Program on Indian Reservations (FDPIR), or through identification of students on other lists, including students who are homeless, foster children, and children in other specified categories (see Chapter 2 for details). The second alternative allows the Secretary of Agriculture to consider use of a periodic socioeconomic survey of households of schoolchildren by not more than three school food authorities (SFAs) participating in the NSLP. The third option is the topic of this report. The act authorizes the Secretary of Agriculture to consider implementing the approach recommended by this panel for using estimates from the American Community Survey (ACS) and other data sources to determine reimbursement under a new universal freefeeding provision that reduces administrative burden compared with the traditional approach of taking applications and counting meals. We call this option the ACS Eligibility Option (AEO).

In 2009, prior to the authorization of the three new special provisions, FNS began investigating the feasibility of using data from the ACS in the administration of the school meals programs in lieu of collecting applications. In exchange, schools or entire districts would provide free meals to all students. FNS asked the National Academies' Committee on National Statistics and the Institute of Medicine's Food and Nutrition Board to convene an expert panel to consider ways of using ACS data for implementing the AEO. This, the panel's final report, evaluates the quality of the estimates that would be needed from the ACS for an AEO, suggests key elements of a new AEO provision for consideration by FNS, and specifies a technical approach whereby school districts could determine the utility of ACS estimates for an AEO and assess whether to adopt the AEO. The panel also recommends further research and development to improve

the accuracy of ACS-based estimates and the availability of high-quality data with which to evaluate alternative options for reducing administrative burden and feeding more children under the school meals programs.

OVERVIEW OF SCHOOL MEALS PROGRAMS

USDA has provided assistance to elementary and secondary schools for meals served to students for more than 70 years, initially by providing food commodities and later by also reimbursing school districts for a share of the cost of meals served. The National School Lunch Act, signed by President Truman in 1946, officially authorized the NSLP, although funds had previously been appropriated for more than a decade without specific legislative authority. The 1966 Child Nutrition Act expanded the program and added the SBP on a pilot basis; 1975 legislation made the SBP permanent; and 1998 legislation expanded the NSLP to include reimbursement for snacks served to students in after-school educational and enrichment programs.

In 2010, the NSLP operated in more than 101,600 public and nonprofit private schools and residential child care institutions. The program subsidized lunches for more than 29.6 million students each school day at an annual cost to the federal government of $10.9 billion. The SBP operated in more than 88,600 schools and institutions in 2010 and subsidized breakfasts for 10.8 million students each school day at an annual cost to the federal government of $2.9 billion.[3]

Any child at a participating school may purchase a meal through the NSLP or SBP. Students from families with incomes at or below 130 percent of the U.S. Department of Health and Human Services' (HHS') poverty guideline for their family size or who participate in certain other assistance programs are eligible for free meals.[4] Those with incomes greater than 130 percent of the poverty guideline and less than or equal to 185 percent of the poverty guideline are eligible for reduced-price meals. For reduced-price meals, students can be charged no more than $.40 for lunch and no more than $.30 for breakfast. Students from families with

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[3]FNS provided data for fiscal year (FY) 2010 from the National Data Bank on July 5, 2011.

[4]The U.S. Department of Health and Human Services' (HHS') Poverty Guidelines typically are published in January. In about March, FNS publishes the income eligibility guidelines applicable to the school meals programs. The 2011 child nutrition program income eligibility guidelines were issued March 25, 2011, and will be effective from July 1, 2011, to June 30, 2012. For 48 states and the District of Columbia, a family of four with income less than or equal to $29,055 is eligible for free meals, and with income greater than $29,055 and less than or equal to $41,348 is eligible for reduced-price meals. Income-eligibility guidelines vary by family size and are higher for Alaska and Hawaii. See http://www.federalregister.gov/articles/2011/03/25/2011-6948/child-nutrition-programs-income-eligibility-guidelines.

incomes over 185 percent of the poverty guideline pay full price, although their meals are still subsidized to some extent. School districts set their own prices for full-price meals but must operate their meal services as nonprofit programs. Most of the support USDA provides to schools in the NSLP and SBP comes in the form of a cash reimbursement for each meal served. As a result, schools must count and report the number of qualified meals[5] by eligibility category (free, reduced-price, or full-price).[6]

To determine students' eligibility for free or reduced-price meals each year, school districts must publicize the availability of those meals and accept applications by interested families. School districts must also conduct verification studies of samples of applications to determine the accuracy of the information that was provided and the eligibility status based on that information. In addition, school districts, usually through their state education agency, are required to work with other program agencies to directly certify students who are categorically eligible—that is, automatically eligible for free school meals because their families are enrolled in another assistance program, including SNAP, TANF, and FDPIR.[7] The families of categorically eligible students who are not directly certified can also establish their eligibility for free meals by providing a SNAP, TANF, or FDPIR case number on an application.

For many years, federal, state, and local officials have been concerned about the burden of eligibility determination, verification, and meal counting, not only because of the time and resources required but also because of the potential to discourage participation by families whose children would be eligible for free or reduced-price meals. One problem with the current process is the time required in the school cafeteria line to ascertain each child's eligibility status, which adds to program costs and the time each child spends in the lunch line. Another factor that potentially discourages participation is the perceived stigma of distinguishing between students who receive free or reduced-price meals and those who must pay full price. While overt identification of students receiving free or reduced-price meals is prohibited, an FNS study (U.S.

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[5]A *qualified meal* is one that satisfies the nutritional guidelines of the school meals programs; see Institute of Medicine (2009).

[6]Reimbursement rates for school lunches during school year 2011-2012 are $.26 for full-price lunch, $2.37 for reduced-price lunch, and $2.77 for free lunch for schools with less than 60 percent of students eligible for free or reduced-price meals in 2009-2010. If their free or reduced-price percentage was 60 percent or more, they are eligible for an additional $.02 per meal for each category. See http://www.fns.usda.gov/cnd/Governance/notices/naps/NAPs11-12.pdf.

[7]The 2004 Child Nutrition and WIC Reauthorization Act required that all school districts establish a system of direct certification of students from households that receive SNAP benefits by school year 2008-2009.

Department of Agriculture/Food and Nutrition Service, 1994a) suggested that perceived stigma is a major factor in nonparticipation. The study observed that perceived stigma generally is more of an issue with high school than with elementary school students, with middle school students being in a transition stage. More recently, Mirtcheva and Powell (2009:485) confirmed that "stigma or possibly peers, affected participation [in the NLSP]. Neighborhood and school contextual variables had significant effects on school lunch take-up and the results differed between high school and elementary/middle school students."

As noted earlier, to reduce administrative costs and expand participation, federal regulations issued in 1980 permitted individual schools to use one of two special provisions—Provisions 1[8] and 2—designed to reduce paperwork and administrative burden in the school meals programs; in 1995, Provision 3 was added. Provisions 2 and 3 require that schools offer free meals to all participating students in exchange for collecting applications from students' families (and using direct certification) and counting meals served by category at most once every 4 years. Then, for the duration of use of either provision, schools count the total meals served daily and claim reimbursement by category using the information from the last year in which applications were taken and meals were counted by category.[9] In 2004, the Child Nutrition and WIC Reauthorization Act (Public Law 108-265) expanded the opportunity to use Provision 2 or 3 to schools or groups of schools.

In 2010, the Healthy, Hunger-Free Kids Act established a new special provision—the CEO—that allows schools to provide universal free meals. The CEO has been implemented as a pilot program in three states—Illinois, Kentucky, and Michigan—during school year 2011-2012. In 2014-2015, all states will be eligible to participate. The states identified qualified school districts as those with at least one school eligible to participate. A school is eligible to participate if the total number of identified students (categorically eligible according to state or local lists, not applications) constitutes 40 percent or more of enrolled students. Whether a qualified school district will choose to participate in the CEO is up to the district. The total reimbursement to the district under the CEO is the sum of two components. The first is the product of the number of meals served, the reimbursement rate for free meals, the percentage of enrolled stu-

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[8]Provision 1 requires recertification every 2 years and may be used only by schools that have at least 80 percent of students eligible for free or reduced-price meals. Provision 1 does not involve providing free meals to all students.

[9]Provision 2 uses meal counts in the current year and claiming percentages from the base year to determine reimbursement, while Provision 3 uses meal counts in the base year and adjustments for enrollment and number of operating days in the current year to determine reimbursement. More detailed information about these provisions is provided in Chapter 2.

dents who are identified divided by 100, and a factor specified by law/regulation (currently 1.6).[10] The second component is the product of the number of meals served, the reimbursement rate for full-price meals, and 1 minus the product of the percentage of enrolled students who are identified divided by 100 and the factor. Districts that participate must conduct direct certification every 4 years, but may conduct direct certification more frequently. Provisions 1, 2, and 3 and the CEO are discussed in more detail in Chapter 2.

While one in eight school districts had adopted Provision 2 and another 1 percent had adopted Provision 3 as of 2004-2005,[11] program operations under these provisions can be challenging. At the end of 4 years, when it is time to apply for an extension or establish a new base year, many schools have lost some of the institutional knowledge about procedures needed to process applications, and families are no longer accustomed to completing the application form.

FNS would like to develop new methods for reducing the administrative burden on schools and families and making it easier for more low-income students to participate in the school meals programs. The AEO is one possible approach to accomplishing this objective. If ACS-based estimates could be developed reliably for attendance areas for schools, groups of schools, or entire districts, it might be possible to eliminate entirely the need for schools to determine eligibility on a case-by-case basis every year or once every few years, and more schools and districts might choose to provide free meals to all of their students.

CHARGE TO THE PANEL

In response to a request from FNS, a panel of experts, convened by the Committee on National Statistics and the Food and Nutrition Board, studied technical and operational issues involved in using the ACS and other information to provide small-area estimates of students who are eligible for free and reduced-price school meals. These estimates would provide "claiming percentages" by which USDA would reimburse school districts for providing free meals to all students attending specified schools. The charge to the panel states:

> The panel will consider the ability of the ACS to provide estimates for school attendance areas, built by aggregating sampled values for census

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[10]For purposes of reimbursement, the percentage of identified students times 1.6 is capped at 100 percent.

[11]According to U.S. Department of Agriculture/Food and Nutrition Service (2007a:47, vol. I), 12.9 percent of schools reported using Provision 2 and 1.3 percent Provision 3 in a nationally representative survey conducted during school year 2004-2005.

blocks and applying sampling weights. It will consider the quality of these estimates in terms of sampling variability, reporting error, timeliness, and other features that may affect their fitness for use, and how they might be used in combination with estimates from other data sources, such as the Census Bureau's Small Area Income and Poverty Estimates Program (SAIPE) and administrative records. It will also address the process by which school districts and USDA can best obtain needed ACS estimates from the Census Bureau and the effects that expanding free school meals may have on participation in meal programs.

The panel conducted its work in two phases and issued two reports during a 36-month period: (1) the panel's interim report (National Research Council, 2010), released at the end of year one, outlined methods for developing ACS-based estimates and the panel's plan for evaluating those estimates; and (2) this, the panel's final report, presents conclusions and recommendations concerning a method for making use of the ACS to implement the AEO. The Committee on National Statistics obtained input during the project as needed from the Food and Nutrition Board.

STUDY APPROACH

In addition to considering the issues explicitly identified in its charge, the panel examined the quality and comparability of administrative data concerning school district enrollment and percentages of students certified as eligible for free and reduced-price meals; compared the definitions of eligible students in the school meals programs against the combination of ACS variables that best approximates those definitions; and evaluated model-based eligibility estimates[12] provided by the U.S. Census Bureau. These assessments and evaluations led the panel to formulate several research recommendations.

The panel began its work by learning about the school meals programs from FNS and about the ACS, SAIPE model-based estimates, and geographic issues from the U.S. Census Bureau. We gathered information about the School Attendance Boundary Information System (SABINS), a database of school attendance boundaries developed with funding from a National Science Foundation grant, and worked with the principal investigator, Dr. Salvatore Saporito, to develop attendance boundaries for schools in the districts we selected for case studies. We learned about assessments of the accuracy of ACS data from researchers and principal data users and about work on the impact of income variability on eligibility for school meals from the Economic Research Service, USDA. We

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[12]The model based-estimates provided by the Census Bureau are described in more detail in Chapter 3 and Appendix C.

listened to presentations from the Government Accountability Office concerning its evaluations of the school meals programs and learned about the ACS group quarters data and plans for the future of the ACS from the Census Bureau. We sought information about administrative data from FNS and the National Center for Education Statistics (NCES) concerning the number of schools in districts, enrollment, percentages of students certified as eligible for free meals, and percentages certified as eligible for reduced-price meals. We compared these data and found that although they are frequently consistent, they conflict more often than we expected.

The panel collected a considerable amount of data to support the study. Five case study districts—Austin, Texas; Chatham County, Georgia; Norfolk, Virginia; Omaha, Nebraska; and Pajaro Valley, California—were recruited to provide detailed information concerning school attendance area boundaries, enrollment, number of children certified as eligible for free meals, and number certified as eligible for reduced-price meals, as well as number of meals served by eligibility category. The case study districts were chosen from medium-sized and large enrollment districts in which at least 25 percent of schools had free and reduced-price eligibility percentages greater than 75 percent, and at least 25 percent of schools had free and reduced-price eligibility percentages less than 50 percent. Because these districts have a substantial number of schools where the AEO is likely to be too expensive to implement (free and reduced-price percentage less than 50 percent) and a substantial number of schools where the AEO may be economically viable (free and reduced-price percentage greater than 75 percent), we thought these districts might represent those that would be interested in the AEO for a group of schools rather than the entire district.

The panel also worked with the Census Bureau and NCES to obtain ACS estimates and standard errors prepared according to our specifications (see Appendix D) for public school enrollment and percentage of students eligible for free, reduced-price, and full-price meals for all school districts in the country and for schools with attendance boundaries in the case study districts. In addition, the Census Bureau provided model-based estimates for percentages eligible for free and for reduced-price meals. We conducted extensive data analysis in formulating our conclusions.

The panel also conducted a workshop with school food authority directors from our case study districts, school food authority directors from districts with experience in using Provision 2, and one state representative. The purpose of the workshop was to help us understand local issues pertaining to a potential new provision such as the AEO, and to learn what information school districts would need to help them decide whether to adopt such a new provision. We also conducted a survey of

districts that had implemented Provision 2 or 3 to obtain information about their reaction to these special provisions.

ORGANIZATION OF THE REPORT

Chapter 2 provides background on the school meals programs and examines quality issues associated with the programs' operations. Chapter 3 describes the panel's technical approach; it summarizes the framework used to evaluate estimates, describes the data collected, and outlines the analyses conducted. Chapter 4 provides the results of the panel's analysis. It addresses the evaluation of systematic differences between ACS estimates and administrative data and the reasons for these discrepancies. It considers the precision of the estimates and relates that precision to year-to-year variation that school districts might expect when using the ACS and to year-to-year variation as observed in administrative data (an indication of the variation in reimbursement that school districts experience now). Chapter 4 also considers the impact of using the lagged data available from the ACS to determine reimbursement. Further, it provides an analysis (based on the limited data available) of differences in reimbursement that might be expected when using eligibility estimates to define claiming percentages instead of using the traditional participation-based claiming percentages. Chapter 5 provides the panel's approach to developing and implementing a new provision based on the ACS (the AEO). It addresses how and where the AEO might be implemented now, as well as issues FNS should consider for future refinement of the AEO. Chapter 6 provides recommendations for future research and the provision of improved data by FNS, NCES, and the Census Bureau. Appendix A is a glossary of acronyms and terms used in the report. Appendixes B through G provide technical detail, while Appendix H contains biographical sketches of the panel members.

2

The School Meals Programs

This chapter describes criteria for eligibility and the process for application, certification, verification, participation, meal counting, and reimbursement in the National School Lunch Program (NSLP) and the School Breakfast Program (SBP), as well as the limitations of the current administrative process. It is essential to understand all elements of the school meals programs before considering alternative procedures that could reduce administrative burden and make it possible to provide nutritious meals to a greater number of the nation's schoolchildren.[1]

ADMINISTRATIVE PROCESS OF THE SCHOOL MEALS PROGRAMS

This section describes the overall flow of the administration of the school meals programs and then provides detail on eligibility; certification; verification; participation; and counting, claiming, and reimbursement.

Process Flow

Figure 2-1 illustrates the flow of the school meals process, from determining the eligibility of students to serving them nutritionally qualified meals, noting that the distributions of students and meals

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[1]This chapter draws heavily on Chapter 2 of the panel's interim report (National Research Council, 2010).

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┌─────────────────────────────────────────────┐
│   Eᴛ: All Students—True Eligibility           │
│              (Unobserved)                     │
└─────────────────────────────────────────────┘
                    │
              Certification process
                    ↓
┌─────────────────────────────────────────────┐
│  Cᴛ: Approved Students—Truth (Unobserved)     │
└─────────────────────────────────────────────┘
                    │
              Certification errors
                    ↓
        ╭───────────────────────────────╮
        │  C_O: Approved Students—Observed │
        ╰───────────────────────────────╯
                    │
                Participation
                    ↓
        ╭───────────────────────────────╮
        │  M_O: Meals Served—Observed Under │
        │       Traditional Approach        │
        ╰───────────────────────────────╯
                    │
                Participation
          Response to Universal Free Meals
                    ↓
┌─────────────────────────────────────────────┐
│  M_U: Meals Served—Universal Free Meals        │
│              (Unobserved)                     │
└─────────────────────────────────────────────┘
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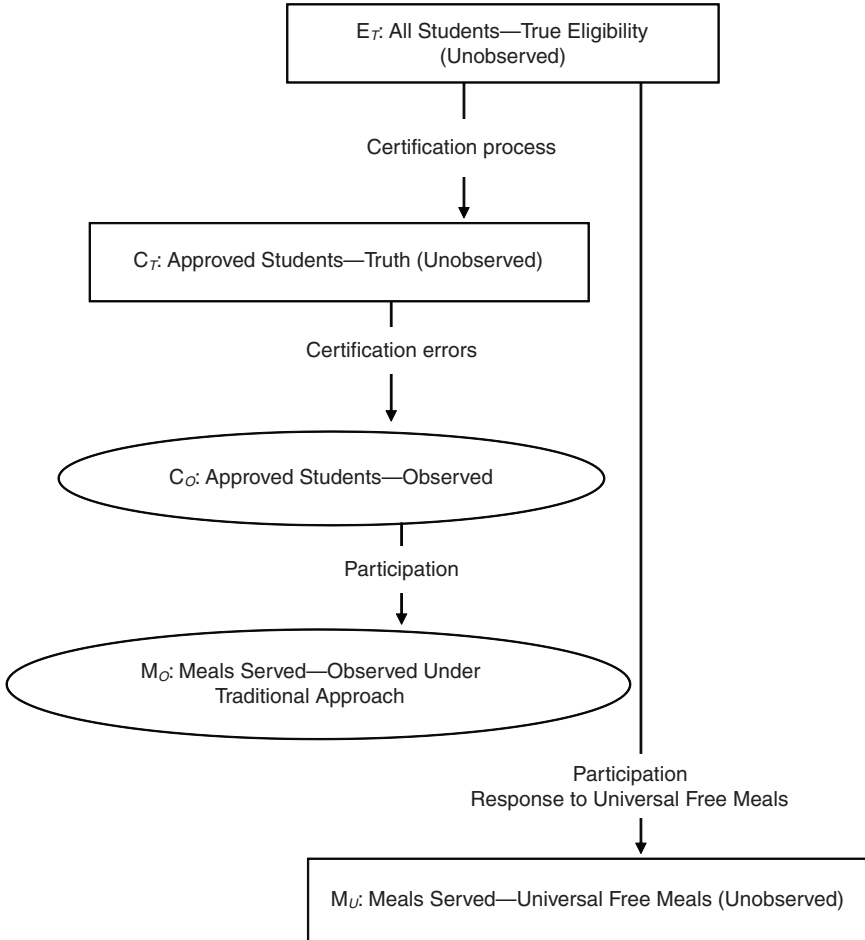
FIGURE 2-1 School meals process and distributions of enrolled students and meals served across free, reduced-price, and full-price categories: Traditional approach and universal free meals.
SOURCE: Prepared by the panel.

served across the free, reduced-price, and full-price meal categories at each point differ. The first two boxes and the first oval in the figure reflect distributions based on all enrolled students; the second oval and last box relate to average daily meals served. For simplicity, we have assumed that the process depicted in the figure occurs instantaneously

and have ignored how the distributions and the relationships among them change over time.[2]

The top box in the figure, labeled "E_T: All Students—True Eligibility (Unobserved)," represents the distribution of all enrolled students by their true eligibility status, including those who are eligible for free meals using program rules described below; those who are eligible for reduced-price meals using those rules; and all other students, who are eligible only for full-price meals. As noted, this distribution is not observed. The process by which students are identified and approved as being eligible for free or reduced-price meals is known as certification.[3] Students who are found to be eligible through the certification process become approved students.

The second box in the figure, labeled "C_T: Approved Students—Truth (Unobserved)," represents the distribution of all enrolled students according to a certification process with no errors. Some students who are eligible for free or reduced-price meals decline to participate in the certification process. All students who either do not apply or are not directly certified for free meals are eligible only for full-price meals, as are those students who apply but are found to be ineligible for free or reduced-price meals. The distribution, C_T, is not observed. The number of students in the free category of C_T will be less than or equal to the number in the free category of E_T by the number of students who were not directly certified and who did not apply for benefits. Enrolled students who were not directly certified and did not apply for benefits will be in the full-price category of C_T. Likewise, students in the reduced-price category of E_T who did not apply will be in the full-price category of C_T.

The first oval (and third item) in the figure, labeled "C_O: Approved Students—Observed," represents the distribution of enrolled students into categories of approved for free meals, approved for reduced-price meals, and eligible for full-price meals, in which the categories of approved for free or reduced-price meals are as determined by the actual operation of the certification process and maintained in school records. The certification process is described below. The difference between C_T and C_O is due to misclassification of students (errors) during the certification process. For example, some students who are eligible for free meals may have been approved for reduced-price meals.

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[2]As discussed below, a student paying full price at the beginning of the school year can be approved for free meals later in the year if, for example, the family's income falls. Once approved, the student can continue to receive free meals for the remainder of the year (and up to 30 days into the next year until a new eligibility determination is made), even if the family's income rises above the eligibility threshold for free meals.

[3]The certification process encompasses both direct certification by comparison of student enrollment lists with state and local lists of participants in several means-tested programs and the solicitation, submission, and review of applications.

On any given day, a student may bring a meal from home or purchase a meal that does not qualify for reimbursement because it does not satisfy the nutritional requirements of the school meals programs. Hence, schools must count the total number of reimbursable meals served each day and note whether each student taking a meal is approved for a free or reduced-price meal or must pay full price. The last two distributions in Figure 2-1 reflect the distribution of average daily reimbursable meals served across the three categories.

The second oval (and fourth item) in the figure, "M_O: Meals Served— Observed Under Traditional Approach," represents the distribution of meals served across the free, reduced-price, and full-price categories in a school that uses the traditional procedures for certifying students and claiming reimbursement. While some students never participate (take meals) or participate on only some days, others participate every day. When students line up in the cafeteria with their trays, a cashier determines whether each meal served qualifies as reimbursable under the school meals programs according to such criteria as food group composition and serving size. The cashier determines whether the student is approved for a free or reduced-price meal in a way that ensures there will be no overt identification of the student's eligibility category.[4] This process provides the meal counts maintained in school records that are used to determine federal reimbursements in the school meals programs.

The third box (and fifth item) in the figure, "M_U: Meals Served— Universal Free Meals (Unobserved)," represents the participation distribution when meals are provided free to all students. The distribution is unobserved because meals are not counted by category when they are provided free under a special operating provision such as Provisions 2 or 3 or the American Community Survey (ACS) Eligibility Option (AEO). The available evidence suggests that if meals are provided at no cost, more students participate. This distribution is important in assessing the costs and benefits of a new provision, and a primary objective of the panel was to determine whether there is a reliable and operationally feasible method for estimating this distribution for a school, group of schools, or school district using available data.

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[4]The Richard B. Russell National School Lunch Act (Section 9B(10):3-22) states

(10) No physical segregation of or other discrimination against any child eligible for a free lunch or a reduced-price lunch under this subsection shall be made by the school nor shall there be any overt identification of any child by special tokens or tickets, announced or published list of names, or by other means.

Available: http://www.fns.usda.gov/cnd/governance/Legislation/NSLA_12-13-10.pdf.

Eligibility

Students are eligible for free school meals if their family's "current" income is at or below 130 percent of the poverty guideline for their family size. Current income requested on the application form "may be for the current month, the amount projected for the first month the application is made for, or for the month prior to application" (U.S. Department of Agriculture/Food and Nutrition Service, 2011b). Students are "categorically eligible" for free meals if someone in the family participates in certain other means-tested public assistance programs targeting the low-income population. Specifically, students are categorically eligible for free meals if their families receive assistance from the Supplemental Nutrition Assistance Program (SNAP, formerly the Food Stamp Program), Temporary Assistance to Needy Families (TANF), or the Food Distribution Program on Indian Reservations (FDPIR). A student also is categorically eligible if he/she is enrolled in a Head Start or Even Start program or is (1) a homeless child as determined by the school district's homeless liaison or by the director of a homeless shelter, (2) a migrant child as determined by the state or local Migrant Education Program coordinator, or (3) a runaway child who is receiving assistance from a program under the Runaway and Homeless Youth Act and is identified by the local educational liaison. With the passage of the Healthy, Hunger-Free Kids Act of 2010, foster children also are categorically eligible for free meals.

Students who are not eligible for free meals are eligible for reduced-price meals if their family's "current" income is greater than 130 percent of the poverty guideline and at or below 185 percent of the poverty guideline. All other students are eligible only for full-price meals (U.S. Department of Agriculture/Food and Nutrition Service, 2011b).

Certification

Certification is the process by which students are approved as being eligible for free or reduced-price meals. There are two types of certification: direct certification and the solicitation, submission, and review of applications. School districts, often through their state education agency, directly certify "categorically eligible" students based primarily on their participation in SNAP, TANF, or FDPIR. The 2004 Child Nutrition and WIC Reauthorization Act required that all school districts establish a system of direct certification of students from households that receive SNAP benefits by school year (SY) 2008-2009. Some states or districts also make use of TANF or other program data as part of direct certification. For direct certification, states or districts match lists of students (including names, addresses, and so on) with the administrative data concerning individuals participating in SNAP or other assistance programs. Students

matched in this way are "directly certified" as being eligible for free school meals. Parents are notified that their children are eligible and do not need to file an application. Matching for direct certification is done at least once a year, and beginning in 2011-2012 will be done three times a year.[5] Some states and districts conduct direct certification more frequently to identify newly eligible students. For example, Washington State conducts direct certification monthly. In 2009-2010, an estimated 72 percent of students from SNAP-participant households nationwide were certified for free school meals through direct certification without applications.[6] In 2010-2011, this number increased to 78 percent.[7] As a result of errors in record matching or participation in a program for which a state does not perform direct certification, however, some categorically eligible students are not directly certified. Families of such students can establish their categorical eligibility by providing a SNAP, TANF, or FDPIR case number on their application for school meals.[8]

The application process begins just prior to and at the start of a school year (normally mid-July through early September), when school districts send a letter to the parents of their students describing the school meals programs, inviting them to apply, and providing an application form.[9] The application requests information about participation in SNAP or other assistance programs, family composition, and family income. School or district officials review the applications and make a determination as to whether the students listed on the application should be approved for free or reduced-price meals. If an application lists a legitimate case number for SNAP or another approved program, the students are certified as being categorically eligible for free meals.

While most applications are submitted at the beginning of the school year, applications and eligibility are in effect from the date of approval through the entire school year and up to 30 operating days into the subsequent school year until a new eligibility determination is made. A family may submit an application at any time during the year, and it may do so later in the year if, for example, its income has fallen or it has started

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[5]A 2011 interim rule issued by the U.S. Department of Agriculture (USDA) requires direct certification using SNAP records at least three times a year, beginning in 2011-2012.

[6]State-level direct certification rates for SNAP (excluding Alaska, with a direct certification rate over 100 percent) ranged from 47 percent to 91 percent. A SNAP direct certification rate may be overstated if the state also directly certifies using TANF or FDPIR records (U.S. Department of Agriculture/Food and Nutrition Service, 2010:14).

[7]In 2010-2011, state-level direct certification rates ranged from 51 percent to 97 percent (excluding Alaska) (U.S. Department of Agriculture/Food and Nutrition Service, 2011a:14).

[8]If the family provides a valid SNAP, TANF, or FDPIR case number on the application, they do not need to provide further information about family income.

[9]Some districts are moving to electronic applications.

TABLE 2-1 Percentage of Enrolled Students by Approval Status for School Meals Programs, Fiscal Years (FY) 2005-2010

Fiscal Year	Approved for Free Meals (%)	Approved for Reduced-Price Meals (%)	Must Pay Full Price for Meals (%)
2010	42.5	8.4	49.1
2009	40.1	8.6	51.3
2008	37.9	8.6	53.5
2007	37.1	8.3	54.6
2006	37.8	8.4	53.8
2005	37.1	8.1	54.8

NOTE: Approval status for the school meals programs includes both the National School Lunch Program (NSLP) and the School Breakfast Program (SBP).
SOURCE: Tabulation from the Food and Nutrition Service (FNS) National Data Bank provided to the panel, July 5, 2011.

participating in SNAP or TANF, qualifying it for greater benefits under the school meals programs.

The distribution of approved students by category for the school meals programs in fiscal years (FY) 2005 through 2010 is shown in Table 2-1. This is the C_O distribution in Figure 2-1.

It should be noted that not all families with students who are eligible for free or reduced-priced meals submit applications. In 1994, the Food and Nutrition Service (FNS) reported that "available data indicate that between 16 percent and 25 percent of potentially eligible families do not apply for school meals benefits" (U.S. Department of Agriculture/Food and Nutrition Service, 1994a:1-5). Although this may no longer be true in light of incentives (such as the allocation of funds in other programs using the school lunch eligibility percentage) and processes (such as direct certification) for certifying as many eligible students as possible for free meals, more recent estimates are not available.

An FNS study enabled a comparison of the distributions of eligible and certified students (U.S. Department of Agriculture/Food and Nutrition Service, 1999). It used data from the Current Population Survey (CPS) to estimate the percentage of students who were income-eligible for free and reduced-price meals, providing a survey-based estimate for E_T (see Figure 2-1), with eligibility based on annual income data. These estimates were compared with the numbers of students approved as eligible for free or reduced-price meals, C_O. Table 2-2, taken from that report, indicates that the number of students certified was growing from 1993 through 1998, whereas the number eligible according to annual income was flat or declining. By 1998, the number of students approved for free meals was 127 percent of the number of students who were estimated to be income-eligible for free meals, and the number of students approved for free or

TABLE 2-2 Numbers of Students Eligible for the National School Lunch Program (NSLP) from Two Sources: (1) Current Population Survey (CPS) Estimates Based on Annual Income and (2) NSLP Certifications for Free and Reduced-Price Meals (in thousands), 1993-1999

Year	Free Meals			Free and Reduced-Price Meals		
	CPS Income-Eligible	NSLP-Certified	Certified/Eligible (%)	CPS Income-Eligible	NSLP-Certified	Certified/Eligible (%)
1999	12,464	15,876	127	18,928	19,260	102
1998	13,128	15,965	122	19,190	19,067	99
1997	13,461	15,799	117	19,416	18,762	97
1996	13,382	15,415	115	19,727	18,273	93
1995	13,655	14,920	109	20,030	17,577	88
1994	13,718	14,396	105	19,609	16,952	86
1993	13,924	13,792	99	19,750	16,273	82

SOURCE: U.S. Department of Agriculture/Food and Nutrition Service (1999:3, 5).

reduced-price meals was 102 percent of the number of students who were estimated to be income-eligible for free or reduced-price meals, indicating the possibility of over certification in the school meals programs. As noted in a study by the National Research Council of the National Academy of Sciences, "results like this contributed to the Improper Payments Act of 2002, which requires that various federal agencies identify and reduce erroneous payments in their programs" (National Research Council, 2009:14).[10] Subsequent research found that at least some of the difference between income eligibility estimated from the CPS and approval status under the school meals programs could be due to how income relative to poverty is measured (annual or monthly) and to changes in monthly income from the time of application to the time of verification (U.S. Department of Agriculture/Economic Research Service, 2006b).

In response to the Improper Payments Act, FNS funded the Access, Participation, Eligibility, and Certification (APEC) Study in 2004 to obtain national estimates of the amounts and rates of erroneous payments in the NSLP and SBP (U.S. Department of Agriculture/Food and Nutrition Service, 2007b). Erroneous payments may be due to certification errors attributable to household misreporting or administrative mistakes or to

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[10]As discussed in Chapters 3 and 5 of the 2009 National Research Council report, estimates of eligibility based on annual income are likely to be too low, given that families may have 1 or more months of low income that would qualify them for free or reduced-price meals even when their annual income exceeded the income eligibility limits.

noncertification errors in counting and claiming payment for reimbursable meals. The study used a complex sample design to survey school districts, schools, and students.

The APEC study provided baseline estimates of erroneous payments for the 2005-2006 school year. It also provided parameters for estimation models to allow FNS staff to update estimates of erroneous payments. The study found that 77.5 percent of all certified students and denied applicants were correctly certified or denied meal benefits, whereas 22.5 percent were certified in error or erroneously denied benefits. The study also found that overcertification was more common than undercertification: the percentage of students certified for a higher level of benefits than that for which they were eligible (the overcertification rate) was 15 percent; the percentage of students either certified for a lower level of benefits than that for which they were eligible or erroneously denied benefits (the undercertification rate) was 7.5 percent. More detailed results from the APEC study are discussed later in this chapter.

Verification

In addition to special studies, such as the APEC study, the accuracy of the certification process is examined through a requirement for school districts to verify a sample of NSLP applications annually. Typically, a school district is required to conduct an annual verification of 3 percent or 3,000 (whichever is smaller) of the applications approved and on file as of October 1 of the current school year.[11] Verification is to be completed by November 15 of the current school year. Samples are to be selected from "error prone" applications, those from families whose reported monthly income is within $100 of a school meals eligibility threshold (130 percent or 185 percent of the applicable poverty guideline). The households that submitted the applications selected for verification are required to submit documentation of income for any point in time between the month prior to application and the time of verification. School districts make at least one follow-up attempt with households that fail to respond. Students in households that fail to provide the required documentation are removed from eligibility. Results of verification studies are reported annually on form FNS-742. Data for each school district are reported through state agencies to FNS regional offices, which upload the data to FNS headquarters, where they are maintained.

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[11]In some states, the state agency conducts the verification.

TABLE 2-3 Official National School Lunch Program (NSLP) Participation (average daily meals, divided by 0.927) and Percentage of Lunches Served by Approval Category, Fiscal Years (FY) 2005-2010

Fiscal Year	NSLP Participation	Percentage of Lunches Served		
		Free	Reduced Price	Full Price
2010	31,746,374	55.4	9.5	35.1
2009	31,311,515	52.0	10.1	37.9
2008	31,015,551	49.6	10.1	40.3
2007	30,629,762	48.9	10.0	41.2
2006	30,128,292	49.0	9.8	41.2
2005	29,645,759	49.2	9.7	41.1

SOURCE: Tabulation from the Food and Nutrition Service (FNS) National Data Bank provided to the panel, July 5, 2011.

Participation

Any student attending a school that participates in the school meals programs may obtain a meal for free or at the reduced price, if so approved, or by paying the full price for the meal. As noted earlier, cashiers assess which meals meet the nutritional requirements of the NSLP and SBP and, for qualifying meals, record each student's approval status (free, reduced price, full price) in a way that does not overtly identify the student's status. Meal counts by category are aggregated for each month for the school, the school district, and the state. This process provides the meal counts maintained in school records, which are also reported at the state level to FNS via form FNS-10.

FNS defines participation to be the 9-month (September-May) average of each month's average daily meals served, divided by an attendance factor of .927 to account for absenteeism. This yields an estimate of the expected number of meals that would be served if students were never absent. Table 2-3 is from a special tabulation from the FNS National Data Bank that was provided to the panel in 2011. It shows participation in the NSLP by year and the percentage of meals served that were free, reduced-price, or full-price. The percentage distribution is M_O in Figure 2-1.[12]

Another way of analyzing participation is to calculate a rate for each meal category (see Table 2-4). Dividing participation (average daily number of meals served divided by .927) in a category by the total number

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[12]The factor .927 is used by FNS to estimate what participation would be if students were never absent. FNS derives participation estimates by applying the assumption that all students, including those who are eligible for free and reduced-price meals, attend school at the same rate of .927. The panel did not use this factor in any of its analyses.

TABLE 2-4 National School Lunch Program (NSLP) Participation Rates by Approval Category, Fiscal Years (FY) 2005-2010

	Participation Rate (Percentage)		
Fiscal Year	Free Approved	Reduced Price Approved	Full Price
2010	81.9	73.1	43.7
2009	80.5	72.8	45.9
2008	80.7	72.2	46.4
2007	80.8	73.5	46.2
2006	78.5	70.8	46.3
2005	79.1	71.5	44.9

NOTE: The participation rate is computed as average daily meals served in category divided by the product of .927 and the number of students certified in that category. The factor .927 is intended to account for the fact that not all enrolled students are at school every day.
SOURCE: Tabulation from the Food and Nutrition Service (FNS) National Data Bank provided to the panel, July 5, 2011.

of enrolled students approved in that category shows consistently higher participation by students approved for free meals (81.9 percent in 2009-2010), followed by students approved for reduced-price meals (73.1 percent in 2009-2010). Students having to pay full price participate at lower rates (43.7 percent in 2009-2010).

Additional information on participation is available from the School Nutrition Dietary Assessment Study-III (SNDA-III) (U.S. Department of Agriculture/Food and Nutrition Service, 2007a). The main focus of the study was on assessing the nutritional content of school meals and identifying students' and parents' reasons for participation or nonparticipation. The study used the following two definitions of participation: (1) the percentage of enrolled students who took a meal that qualified under the school meals programs on a target day and (2) the percentage who "usually" took such a meal, with "usually" being defined as 3 or more days per week.

On a typical day in the 2004-2005 school year, about 62 percent of all students participated in the NSLP and about 18 percent in the SBP according to SNDA-III. Nearly three-quarters of students reported participating in the NSLP on 3 or more days per week, and one-quarter reported participating in the SBP on 3 or more days per week. Parents of students who did not participate in the NSLP reported some of the same reasons for this decision as those given by students—for example, that their child did not like the cafeteria food (68 percent) or preferred to bring a lunch from home (65 percent).

Table 2-5, based on SNDA-III, shows the percentage of enrolled students who participated in the NSLP on a target day in 2004-2005 sepa-

TABLE 2-5 Target Day Participation Rates in the National School Lunch Program (NSLP) (percentage of enrolled students) from the School Nutrition Dietary Assessment Study-III, by Income Level, Meal Category, and School Level

Income/Meal Category	Elementary (%)	Middle (%)	High (%)	All Students (%)
Income relative to poverty guideline:				
Less than or equal to 130 percent	86.9	71.7	55.5	75.7
Between 130 and 185 percent	86.5	63.5	64.1	75.5
More than 185 percent	62.1	54.6	36.3	52.6
Receipt of meals (parent report):				
Receives free or reduced-price meals	86.5	70.7	66.4	78.8
Does not receive free or reduced-price meals	60.1	51.9	34.3	49.6

SOURCE: U.S. Department of Agriculture/Food and Nutrition Service (2007a:36, vol. II).

rately for elementary, middle, and high school students by income level and reported receipt of free or reduced-price meals (official approval status was not determined). The table shows that about 87 percent of all elementary school students with family income less than or equal to 185 percent of the poverty guideline (that is, students income-eligible for either a free or a reduced-price meal) and 62 percent of all elementary school students with family income more than 185 percent of the poverty guideline participated in the NSLP on the target day. For middle school students, participation rates were lower than those for elementary school students in all three income categories; participation by those income-eligible for a reduced-price meal fell between participation by those eligible for a free meal and those not eligible for either a free or a reduced-price meal. For high school students, participation rates were lowest of all among those income-eligible for free meals and those income-eligible only for full-price meals.

One of the panel's objectives was to recommend a method for estimating the unobserved distribution in Figure 2-1 labeled "M_U: Meals Served—Universal Free Meals (Unobserved)." This distribution reflects what would happen in the future if a district adopted free meals for all students through a new approach that used available data, such as those from the ACS, to establish claiming percentages[13] for reimbursement from

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[13]Claiming percentages are used in determining a school district's reimbursement for the school meals programs. In the traditional approach in the contiguous states in the 2011-2012 school year, a school district with less than 60 percent of students eligible for free or reduced-

the U.S. Department of Agriculture (USDA), the AEO option. A student who was approved for a reduced-price meal would save $.40 per meal with universal free meals, and a student who would otherwise pay the full price for a meal would save the entire amount that was charged by the school district. Consequently, one might expect that the increased participation due to providing free meals to all students would be greatest among students who formerly had to pay full price for their meals, followed by those who paid a reduced price. As described in Chapter 3, however, one participant in the panel's workshop with selected school nutrition directors noted that, based on his experience, providing free meals to all students also increases participation among students who have always been eligible for free meals because the stigma associated with the program has been removed.

Counting, Claiming, and Reimbursement

The meal-counting process begins when the cashier determines whether a student's meal qualifies as reimbursable (by satisfying the programs' nutritional requirements) and whether the student is approved for a free meal or a reduced-price meal or must pay full price. As noted above, a student's approval status cannot be overtly identified by this process. Thus, for example, all students taking a reimbursable school meal must go through the same cashier line, regardless of eligibility status. According to the APEC report (U.S. Department of Agriculture/Food and Nutrition Service, 2007b:16, vol. I):

> To obtain meal reimbursements, school personnel must accurately count, record, and claim the number of reimbursable program meals actually served to students by category—free, reduced-price, and paid (except for schools using Provision 2 or Provision 3 in non-base years). To do this, school districts must put in place a system that issues benefits, records meal counts at the school's point of service, and reports them to the central district office. The district must receive reports of meal counts from the schools, consolidate them, and submit claims for reimbursement to its state agency.

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price meals in the 2009-2010 school year was reimbursed $2.77 for every free lunch served, $2.37 for every reduced-price lunch served, and $0.26 for every full-price lunch served as part of the NSLP. A district with 60 percent or more of students eligible for free or reduced-price meals in the 2009-2010 school year received an additional $.02 per lunch. There are separate reimbursement rates for breakfast. The claiming percentages are the percentage of total meals (separate for lunch and breakfast) that are served to students eligible for free meals, the percentage served to students eligible for reduced-price meals, and the percentage served to students who must pay full price.

TABLE 2-6 Federal Reimbursement Rates for 2010-2011 School Meals Programs by Eligibility Category

Eligibility Category	Lunch Rate	Breakfast Rate
Free	$2.72 ($2.74)	$1.48 ($1.76)
Reduced Price	$2.32 ($2.34)	$1.18 ($1.46)
Full Price	$0.26 ($0.28)	$0.26 ($0.26)

NOTE: Dollar amounts in parentheses are reimbursement increments for schools serving large proportions of free and reduced-price meals (see text).
SOURCE: See http://www.fns.usda.gov/cnd/Governance/notices/naps/NAPs10-11.pdf.

States report monthly aggregates to FNS on form FNS-10. FNS uses these data to determine reimbursements due to the states, which distribute the reimbursements to the school districts.

Most of the support USDA provides to schools in the NSLP and SBP comes in the form of a monthly cash reimbursement for each meal served. Table 2-6 shows reimbursement rates by eligibility category for school year 2010-2011. (Rates may be adjusted annually.) Schools that served more than 60 percent free and reduced-price lunches 2 years earlier are eligible for $.02 more per category for the NSLP (shown in parentheses in the table); schools that served more than 40 percent free and reduced-price lunches are eligible for higher severe-needs rates for the SBP (shown in parentheses in the table). Higher reimbursement rates also are in effect for Alaska and Hawaii.

SPECIAL PROVISIONS AND OPTIONS FOR OPERATING THE SCHOOL MEALS PROGRAMS

As discussed in Chapter 1, schools, groups of schools, or entire school districts may choose to apply for one of four special provisions or options instead of following the traditional procedures for eligibility determination and meal counting. Typically, they apply for these provisions through the state. These provisions are most appropriate for areas with high percentages of students eligible for free or reduced-price meals. Provisions 1 and 2 were included in federal regulations in 1980, while Provision 3 was included in 1995. The Community Eligibility Option (CEO) was approved under the Healthy, Hunger-Free Kids Act of 2010 and is being implemented as a pilot in Illinois, Kentucky, and Michigan for school year 2011-2012, and will be available to all states in 2014-2015. Each special provision results in some variation on the traditional method for establishing claiming percentages.[14] Two other options were authorized for

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[14]Although claiming percentages are not used explicitly to claim reimbursement under traditional operating procedures, we discuss them explicitly in this report to illustrate the differences among the traditional procedures and the various special provisions and options.

consideration by the secretary of agriculture in the Healthy, Hunger-Free Kids Act of 2010—use of a periodic socioeconomic survey and the AEO. These provisions and options are summarized in Box 2-1.

Provisions 1, 2, and 3, the Community Eligibility Option, Use of a Socioeconomic Survey, and the ACS Eligibility Option[15]

Provision 1 permits schools enrolling at least 80 percent of students who are eligible for free or reduced-price meals to certify students' eligibility for free meals for 2 years instead of reestablishing eligibility every year. Provision 1 enables administrative efficiencies but does not involve providing universal free meals. There are currently very few (perhaps no) schools operating under Provision 1.

Provision 2 permits schools, groups of schools, and entire school districts to establish claiming percentages for federal reimbursement in accordance with information collected during a base period and to serve all meals at no charge for a 4-year period. The first year is the base year, during which the school provides all meals for free but collects applications, makes eligibility determinations, conducts verifications, and takes meal counts by type.[16] During the next 3 years, the school performs no new eligibility determinations or verification checks and counts only the total number of reimbursable meals served each day.[17] Reimbursement during these years is determined by multiplying the total count of reimbursable meals for a claiming month by the percentages of free, reduced-price, and full-price meals served during the corresponding month of the base year to estimate the number of meals served in each category. The base year is included as part of the 4 years. At the end of each 4-year period, the district may apply to the state agency for a 4-year extension if the income level of the school's population has remained stable, declined, or improved only negligibly since the base year.[18] If an extension is not appropriate, the district may return to the traditional method or apply to conduct another Provision 2 base year, use a streamlined base year, or convert to Provision 3 (either

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[15]FNS provides information about all provisions at http://www.fns.usda.gov/cnd/Governance/prov-1-2-3/provision1_2_3.htm.

[16]Note that with the operation of a base year with universal free meals and the collection and processing of applications, the reimbursement for a district is based on data that reflect the impact of changes in participation resulting from the provision of free meals.

[17]Under Provision 2, the count of the total number of meals served need not be broken down by eligibility category.

[18]The income level of the school's population meets this definition if it has not improved by more than 5 percent, after adjusting for inflation, between the base year and the comparison year. Income is measured by the source of socioeconomic data the district used in its approved application for provision status to the state. Available: http://www.fns.usda.gov/cnd/Governance/prov-1-2-3/Prov2Guidance.pdf.

BOX 2-1
Special Provisions

Provision 1   Authorized in 1980. Must have 80 percent or more free- or reduced-price-eligible. Applications every 2 years.

Provision 2   Authorized in 1980. Universal free. Base year with universal free. New base year every 4 years unless extended. Reimbursement: blended reimbursement rate (BRR) using percentage of meals served by category in base year month times meals served in current month.

Provision 3   Authorized in 1995. Universal free. Base year not necessarily with universal free. New base year every 4 years unless extended. Reimbursement: BRR using percentage of meals served by category in base-year month times meals served in base-year month times adjustment.

Community Eligibility Option   Authorized in 2010. Universal free. Implemented in three states in 2011, available to all states in 2014-2015. No applications; uses direct certification and local lists. Reimbursement: BRR based on adjusted fraction identified for free meals, zero for reduced price, and for full price—1 minus the adjusted fraction for free times meals served in current month. Direct certification to be performed at least every 4 years.

ACS Eligibility Option   Authorized for secretary of agriculture's consideration in 2010. Universal free. Base year with universal free. No new base year required. Reimbursement: BRR based on benchmarked ACS estimates of eligibility rates by category and base-year participation rates by category, times meals served in current month.

Socioeconomic Survey Option   Authorized for secretary of agriculture's consideration in 2010 for implementation in not more than three districts. Universal free. Periodic socioeconomic survey to estimate eligibility rates. Reimbursement: BRR based on estimated eligibility rates times meals served in current month.

SOURCE: Prepared by the panel.

with a Provision 3 base year or using the original Provision 2 base year). Some schools use Provision 2 only for the SBP. These schools still collect applications, make eligibility determinations, and perform verifications for households with students that participate in the NSLP.

Provision 3 permits schools, groups of schools, and school districts to receive the same level of federal cash and commodity assistance each year during a 4-year period, with some adjustments. The base year is the last year the school made eligibility determinations and counted reimbursable meals by type, and typically meals are not served free during this year (although they may be). For the subsequent 4-year period, schools must serve meals to all participating students at no charge, and do not make additional eligibility determinations or conduct additional verification checks. Reimbursement is based on current-year reimbursement rates and meals served by category during the base year, with adjustments for changes in enrollment and number of operating days. In contrast with Provision 2, the base year of Provision 3 is not included as part of the 4 years, and schools may charge students for meals during the base year. At the end of each 4-year period, the district may apply to the state for a 4-year extension if the income level of the school's population has remained stable, declined, or improved only negligibly. If an extension is not appropriate, the district may return to the traditional method or apply to conduct another base year, conduct a streamlined base year, or convert to Provision 2 (either with a Provision 2 base year or using the original Provision 3 base year as the base year for Provision 2).

The **Community Eligibility Option** permits schools, groups of schools, and school districts to provide meal service to all students at no charge for 4 years if they identify 40 percent or more of enrolled students as being categorically eligible for free meals through direct certification or as certified by local officials, mainly through lists of, for example, homeless students, migrant students, runaways, or foster students. Such students are termed "identified students." The estimated percentage of free meals is the product of the percentage of enrolled students who are identified and a specified factor (currently 1.6). This percentage is capped at 100 percent. The estimated percentage of full-price meals is 100 percent minus the estimated percentage of free meals.[19] The reimbursement is the total number of meals served times the sum of the product of the percentage of free meals and the free meal reimbursement rate and the product of the percentage of full-price meals and the full-price meal reimbursement rate divided by 100. Schools or school districts are required to conduct direct certification every 4 years to reestablish eligibility and the percentage of identified students. However, they may conduct direct certifica-

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[19]It is assumed that no reduced-price meals are served.

tion more frequently and, if the percentage is larger, may use the larger percentage to claim reimbursement. If the percentage is smaller, they are not required to use it in intermediate years.

A **Socioeconomic Survey** was first used in the Philadelphia Pilot Project. FNS often uses pilot projects to test alternative procedures for the school meals programs. Since 1991 in the School District of Philadelphia, about one-third of schools have been operating under the traditional procedures, and about two-thirds have been providing free meals to all students and developing claiming percentages by combining information about students in households directly certified for free meals with information from a household survey designed to determine eligibility for free and reduced-price meals (Reinvestment Fund, 2007). The application and verification processes are eliminated for the latter schools. The steps in the process for estimating claiming percentages include direct certification, followed by a survey of nondirectly certified students. The direct certification and household survey data showed that 79.6 percent of students attending schools with universal free meals were eligible for free or reduced-price meals in school year 2006-2007. As illustrated later in this section, reimbursement for the part of Philadelphia where eligibility is determined from a socioeconomic survey is based on the eligibility distribution of enrolled students rather than on participation.

In the early 2000s, FNS commissioned the U.S. Census Bureau to develop eligibility estimates for schools in the School District of Philadelphia from the 2000 census long-form sample,[20] which the ACS replaces, to determine the usefulness of such estimates in place of a special survey or other method (U.S. Census Bureau, 2005). The estimates from the decennial census were compared with the counts of students approved for free and reduced-price meals from the National Center for Education Statistics' (NCES') Common Core of Data (CCD) for all schools in Philadelphia. The study found that on average, 61 percent of students were eligible for free or reduced-price meals based on the 2000 census, compared with 74 percent approved according to the CCD.[21]

The Philadelphia pilot, the only district in the country using a socioeconomic survey, was scheduled to end after the 2009-2010 school year.

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[20] Although eligibility for the school meals programs is, as noted above, based on monthly income for students who are not directly certified or otherwise categorically eligible, estimates from the decennial census must be derived using the annual income data that are collected on the long-form questionnaire.

[21] The data cited in this paragraph are for year 2000. Data cited in the preceding paragraph are for 2006-2007. The Reinvestment Fund compared 2000 census Public Use Microdata Sample (PUMS) data with ACS 2005 data and documented a drop of 5 percent in eligibility for free and reduced-price meals (not counting eligibility because of participation in SNAP and receipt of public assistance income).

However, the program was granted an extension, and now the Healthy, Hunger-Free Kids Act of 2010 authorizes the secretary of agriculture to consider an approach that uses a periodic socioeconomic survey of households of children enrolled in schools within a school food authority (SFA) in not more than three SFAs that participate in the NSLP. According to the law, use of a socioeconomic survey would also require universal free feeding and reimbursement based on eligibility as determined through the survey. The law requires further that USDA establish requirements for use of such surveys, including criteria for survey design, sample frame validity, minimum level of statistical precision, minimum survey response rate, frequency of data collection, and other criteria as deemed necessary.

The **AEO** is the name selected by the panel for a potential new provision relying on the ACS and other information to establish claiming percentages.[22] The Healthy, Hunger-Free Kids Act of 2010 authorized the Secretary of Agriculture to consider implementing the AEO. Like Provisions 2 and 3, it would permit schools, groups of schools, and entire school districts to serve all meals at no charge. Under the procedures recommended by the panel, the AEO would, like Provisions 2 and 3, establish claiming percentages for federal reimbursement using information collected during a base period. A difference between the AEO and Provisions 2 and 3, however, is that the AEO claiming percentages would be updated annually, using estimates from the ACS, and there would be no requirement to conduct a new base year periodically. During the first year of the AEO, the participating schools in a district would provide free meals to all students but collect applications, make eligibility determinations, conduct verifications, and count meals by category. The base year data used to determine reimbursement would include the impact on participation of providing free meals. In the following years, the schools would conduct no new eligibility determinations or verification checks and count only the total number of reimbursable meals served each day. The mechanism for determining reimbursement under the AEO is discussed in general later in this chapter, with detail provided in Chapter 5.

Department of Education Requirements for Using NSLP Certification Data Under Provisions 2 and 3 and the CEO

Title 1, Part A, of the Elementary and Secondary Education Act of 1965 (ESEA), as amended, requires a local education agency (LEA) to rank schools based on the percentage of students who are economically disadvantaged and, for accountability purposes, requires reports of progress toward achievement standards for economically disadvantaged students:

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[22]Detail on how the AEO might work is provided in Chapter 5.

To meet this requirement an LEA must have school level data on individual economically disadvantaged students. For many LEAs information from the NSLP is likely to be the best, and perhaps the only, source of data available to identify these students. Moreover, in the case of priority for public school choice and eligibility for supplemental education services, the law specifically requires an LEA to use the same data it uses for making within-district Title I allocations; historically, most LEAs use school lunch data for that purpose.[23]

With Provisions 2 and 3 and the CEO, the NSLP data on which students are eligible for free and reduced-price meals are no longer available during nonbase years. The Department of Education disseminated guidance to states on this issue,[24] which states that "for purposes of disaggregating assessment data by the economically disadvantaged subgroup for reporting and accountability and for identifying students as economically disadvantaged in implementing supplemental education services and priority for school choice, school officials may deem all students in a CEO school as economically disadvantaged." The same treatment is provided for Provision 2 and 3 schools. Further, "when annually determining the eligibility of a CEO school to receive Title I funds and its Title I allocation, an LEA must assume that the percentage of economically disadvantaged students in the school is proportionate to the percentage of meals for which the CEO school is reimbursed for free meals by the USDA for the same school year." Provision 2 and 3 schools are to use the percentage of students certified as eligible for free or reduced-price meals during the base year for this purpose. For schools operating under the traditional approach, the percentages are derived annually from the school meals certification and verification process.

Comparison of Provisions and Options

Provision 1 offers the least reduction of administrative burden among the six alternatives—Provisions 1, 2, and 3; the CEO; use of a socioeconomic survey; and the AEO—because it reduces the burden of the application process by only about one-half by requiring that applications be taken once every 2 years. In the second year, applications are still needed for students new to the school district. Provision 1 has no impact on participation. All other provisions and options offer a greater reduction of administrative burden; in return, schools electing to adopt one of these provisions or options must use sources other than federal funds to pay the

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[23]Memorandum from Carl Harris, deputy assistant secretary for education to state commissioners of education, dated May 20, 2011.
[24]Ibid.

difference between the federal reimbursement and the cost of providing all meals at no charge. According to the Food Research and Action Center, "schools with high percentages of low-income students—75 percent or more in some cases—are able to use Provision 2 for both breakfast and lunch without losing money. Some schools have opted to use Provision 2 for just breakfast when the percentage of free and reduced-price students is as low as 60 percent."[25] According to the SNDA-III study, 12.9 percent of schools used Provision 2 and 1.3 percent of schools used Provision 3 to provide free lunches to all students in school year 2004-2005 (U.S. Department of Agriculture/Food and Nutrition Service, 2007b:47).

The CEO offers the greatest reduction in administrative burden because it does not require base-year applications from families to establish claiming percentages and relies only on identification of categorically eligible students through direct certification and local officials' lists. However, it can be used only by schools or districts with more than 40 percent of enrolled students who are "identified," and according to this criterion, only 3.5 percent of districts reporting on form FNS-742 in 2009-2010 would be eligible to participate in the CEO districtwide.

Provisions 2 and 3 and the AEO could be implemented by any district determining that doing so would be economically feasible, subject to approval. The AEO is similar to Provision 2 in terms of reduction of burden during the first 4-year period. Under the procedures recommended by the panel, however, the AEO would provide additional savings thereafter because it does not require subsequent base years. In comparison with Provisions 2 and 3, the AEO has an advantage in that it uses annual releases of ACS data to update claiming percentages each year to reflect changes in socioeconomic conditions in a district. A disadvantage is that the survey data are less timely and therefore slower to reflect changing conditions than new certification data from a new base year.

ALTERNATIVE REIMBURSEMENT FORMULAS

The reimbursement formulas discussed below may be applied for an entire school district, a group of schools, or an individual school. Should a district choose to use multiple options within the district, the reimbursement formulas are applied separately, and the sum is the reimbursement for the school district.

Under the traditional procedures for operating the school meals programs (and under Provision 1), federal financial assistance to school districts is calculated as the total number of reimbursable meals served to students approved for free, reduced-price, or full-price meals multiplied

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[25]See http://frac.org/newsite/wp-content/uploads/2009/05/provision2.pdf.

by the applicable meal reimbursement rates. Thus, the federal government's outlays (G) for reimbursable meals under the NSLP or SBP are

$$G_t = R^f M_t^f + R^r M_t^r + R^p M_t^p$$

$$= \left[R^f \left(\frac{M_t^f}{M_t} \right) + R^r \left(\frac{M_t^r}{M_t} \right) + R^p \left(\frac{M_t^p}{M_t} \right) \right] M_t$$

$$= \left[BRR_t^T \right] M_t$$

where

- G_t is the federal government's outlay for reimbursable meals in month t, in dollars;
- R^f is the reimbursement rate for free meals for this school year, in dollars (e.g., \$2.77 for the NSLP in 2011-2012, if the school is not eligible for an increment);
- R^r is the reimbursement rate for reduced-price meals for this school year, in dollars;
- R^p is the reimbursement rate for full-price meals for this school year, in dollars;
- M_t^f is the total number of free meals served in month t;
- M_t^r is the total number of reduced-price meals served in month t;
- M_t^p is the total number of full-price meals served in month t;
- $M_t = M_t^f + M_t^r + M_t^p$ is the total number of reimbursable meals served in month t; and
- BRR_t^T is the blended reimbursement rate for the traditional approach (denoted by "T") in month t.

The second way of writing the federal government's outlays shown above (the three terms in brackets) illustrates the use of *claiming rates* (if expressed as a ratio) or *claiming percentages* (if expressed as a percentage). The claiming percentages under traditional operating procedures are the percentage of meals served in each eligibility category (free, reduced-price, or full-price). The third way of writing the federal government's outlays shown above illustrates the concept of the *blended reimbursement rate* (BRR) as a summary measure of the three claiming rates, and it is used in later chapters to illustrate the effects of using different estimates as a basis for reimbursement.

Under Provision 2, the numbers of meals served by category— M_t^f, M_t^r, and M_t^p —are unknown because they are not counted, but the total, M_t, is known, and can be used along with counts of meals served by category during the same month of the base year to determine the

reimbursement amount. Therefore, the reimbursement formula for Provision 2 is

$$G_t^2 = \left[R^f \left(\frac{M_{0,t}^f}{M_{0,t}} \right) + R^r \left(\frac{M_{0,t}^r}{M_{0,t}} \right) + R^p \left(\frac{M_{0,t}^p}{M_{0,t}} \right) \right] M_t$$

$$= \left[BRR_t^2 \right] M_t$$

where

- G_t^2 is the federal government's outlay for reimbursable meals served in month t in Provision 2 schools, in dollars;
- R^f, R^r, and R^p are reimbursement rates as defined above;
- M_t is the total number of reimbursable meals served during month t;
- $M_{0,t}^f$ is the total number of free meals served in month t of the base year;
- $M_{0,t}^r$ is the total number of reduced-price meals served in month t of the base year;
- $M_{0,t}^p$ is the total number of full-price meals served in month t of the base year;
- $M_{0,t} = M_{0,t}^f + M_{0,t}^r + M_{0,t}^p$ is the total number of reimbursable meals served during month t of the base year; and
- BRR_t^2 is the blended reimbursement rate for Provision 2 in month t.

The ratios in the first version of the equation above are the Provision 2 claiming rates, based on the percentage of meals served in each category in the base year. Like the BRR for the traditional approach, the BRR for Provision 2 varies from month to month.

Under Provision 3, meals served by category are estimated by using meals served in the same month of the base year multiplied by a factor reflecting the change in enrollment and the number of operating days relative to the base year. Therefore, the reimbursement formula for Provision 3 is

$$G_t^3 = R^f \delta M_{0,t}^f + R^r \delta M_{0,t}^r + R^p \delta M_{0,t}^p$$

$$= \left[R^f \left(\frac{M_{0,t}^f}{M_{0,t}} \right) + R^r \left(\frac{M_{0,t}^r}{M_{0,t}} \right) + R^p \left(\frac{M_{0,t}^p}{M_{0,t}} \right) \right] \delta M_{0,t}$$

$$= \left[BRR_t^3 \right] \delta M_{0,t}$$

where

- G^3_t is the federal government's outlay in month t for Provision 3 schools, in dollars;
- R^f, R^r, and R^p are reimbursement rates as defined above;
- $M^f_{0,t}$ is the total number of free meals served in month t of the base year;
- $M^r_{0,t}$ is the total number of reduced-price meals served in month t of the base year;
- $M^p_{0,t}$ is the total number of full-price meals served in month t of the base year;
- $M_{0,t} = M^f_{0,t} + M^r_{0,t} + M^p_{0,t}$ is the total number of meals served during month t of the base year;
- δ is a ratio adjustment (ratio of current-year to base-year value) reflecting changes in enrollment and the number of operating days (e.g., if enrollment increased by 5 percent since the base year and the number of operating days were unchanged, the factor would be 1.05); and
- BRR^3_t is the blended reimbursement rate for Provision 3 in month t.

The claiming percentages and BRR under Provision 3 are identical to the claiming percentages and BRR under Provision 2. Total reimbursements are different, however, because under Provision 2, schools count the number of meals served in each month (M_t), while under Provision 3, schools use the number of meals served in that month of the base year, adjusted only for changes in enrollment and operating days (using δ), as an estimate of the meals served in the current month.

Under the Community Eligibility Option, reimbursement is based on the total number of meals served, the ratio of the number of identified students[26] to the number of enrolled students in the base year (or a year since the base year),[27] and a factor specified in the Healthy, Hunger-Free Kids Act of 2010. The factor was set by the act at 1.6, and can be updated by the Secretary of Agriculture beginning with the 2014-2015 school year.

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[26]Identified students are certified as eligible for free meals based on documentation of receipt of benefits or categorical eligibility as described in section 245.6a(c)(2) of Title 7, Code of Federal Regulations. They include students who are directly certified, on the homeless liaison list, income-eligible for Head Start or pre-K Even Start, in residential child care institutions, migrants, runaways, foster children certified through means other than an application, and other nonapplicants approved by local officials.

[27]The base year immediately precedes a district's implementation of the CEO. Under the CEO, districts may conduct direct certification on a yearly basis. If the most current data show an increase in the percentage of enrolled students who are identified, the district may use that percentage for determining the USDA reimbursement. If the data show a decrease, the district may continue to use the original percentage. (From a memorandum issued by the U.S. Department of Agriculture, Food and Nutrition Service, director of Child Nutrition Division, Cynthia Long, dated May 20, 2011.)

The factor is intended to estimate the additional number of eligible students who would have been certified through the traditional application process. The CEO reimbursement formula uses just two rates—free and full price—and is

$$G^{CEO}{}_t = \left[R^f \left(\frac{I}{E} \varphi \right) + R^p \left(1 - \frac{I}{E} \varphi \right) \right] M_t$$
$$= \left[BRR^{CEO} \right] M_t$$

where

- $G^{CEO}{}_t$ is the federal government's outlay in month t for CEO schools, in dollars;
- R^f is the reimbursement rate for free meals as defined above;
- R^p is the reimbursement rate for full-price meals as defined above;
- I/E is the ratio of the total number of identified students (I) to total enrollment (E) as of April 1 of the base year or a subsequent year;
- φ is a factor specified by the Secretary of Agriculture (currently 1.6), and the product $\frac{I}{E} \varphi$ is restricted to being no greater than 100 percent; and
- BRR^{CEO} is the blended reimbursement rate for the CEO.

Under the CEO, the claiming rate for free meals is the ratio of identified students to enrolled students times the factor. The claiming rate for reduced-price meals is zero. The claiming rate for full-price meals is 1 minus the claiming rate for free meals.

Using a socioeconomic survey (as in Philadelphia), a district combines the data from the survey with the number of directly certified students to estimate the percentage of enrolled students eligible for free, reduced-price, and full-price meals. The reimbursement formula is

$$G_t{}^{survey} = \left[R^f \left(\frac{E^f}{E} \right) + R^r \left(\frac{E^r}{E} \right) + R^p \left(\frac{E^p}{E} \right) \right] M_t$$
$$= \left[BRR^{survey} \right] M_t$$

where

- $G_t{}^{survey}$ is the federal government's outlay established for the schools providing free meals to all students;
- M_t is the total number of reimbursable meals served in month t;
- R^f, R^r, and R^p are reimbursement rates as defined above;

- E^f is the number of enrolled students who have been directly certified or estimated as eligible for free meals based on a survey of students' families;
- E^r is the number of enrolled students who have been estimated as eligible for reduced-price meals based on a survey of students' families;
- E is the total student enrollment;
- $E^p = E - E^f - E^r$ is the number of enrolled students who are eligible for full-price meals; and
- BRR^{survey} is the blended reimbursement rate for the schools that provide free meals to all students and use data from the survey to determine reimbursements (roughly two-thirds of the schools in Philadelphia).

In this equation, the claiming percentages are the eligibility ratios E^f/E, E^r/E, and E^p/E.

Under the AEO the panel considered two potential reimbursement equations. The first is modeled after the option that relies on a socio-economic survey and uses claiming rates based on eligibility:

$$G_t^{ACS(1)} = \left[R^f \left(\frac{E^f}{E} \right) + R^r \left(\frac{E^r}{E} \right) + R^p \left(\frac{E^p}{E} \right) \right] M_t$$
$$= \left[BRR^{AEO(1)} \right] M_t$$

where

- $G_t^{ACS(1)}$ is the federal government's outlay for reimbursable meals served in month t by AEO schools in dollars (the (1) denotes that this is the first version of the AEO proposed for using ACS data, and it uses eligibility estimates alone to define the claiming percentages);
- R^f, R^r, and R^p are reimbursement rates as defined above;
- M_t is the total number of reimbursable meals served in month t;
- E^f/E is the estimated fraction of enrolled students who are eligible for free meals based on the ACS and other sources;
- E^r/E is the estimated fraction of enrolled students who are eligible for reduced-price meals based on the ACS and other sources;
- $E^p/E = 1 - E^f/E - E^r/E$ is the estimated fraction of enrolled students who are eligible for full-price meals based on the ACS and other sources; and
- $BRR^{AEO(1)}$ is the BRR under the assumption that claiming percentages are based on student eligibility fractions estimated using the ACS and other information.

The computations for BRR^{survey} and $BRR^{AEO(1)}$ are the same, and these BRRs do not vary from month to month. However, these BRRs are based on different data. A local socioeconomic survey is used to estimate the eligibility-based claiming percentages in the former, and the ACS is used to estimate the eligibility-based claiming percentages in the latter.

In light of the differences between the distributions of students by eligibility category in Table 2-1 and the distributions of meals served by eligibility category in Table 2-3, a concern with the above "enrollment-based" reimbursement equation—that is, an equation based on the distribution of enrolled students—is that it might be unfair to districts. Specifically, as illustrated in an example presented by FNS at the panel's first meeting,[28] districts might receive smaller reimbursements than they would with a "participation-based" equation—that is, an equation based on the distribution of meals served. Therefore, the panel focused on a more general expression for the AEO reimbursement formula:[29]

$$G_t^{ACS(2)} = \left[R^f C^f + R^r C^r + R^p C^p \right] M_t$$
$$= \left[BRR^{AEO(2)} \right] M_t$$

where

- $G_t^{ACS(2)}$ is the federal government's outlay for reimbursable meals served in month t in AEO schools in dollars, with the (2) indicating that this is the second version of the AEO considered by the panel, and it is based on estimated claiming percentages that account for both eligibility and participation;
- R^f, R^r, and R^p are reimbursement rates as defined above;
- M_t is the total number of reimbursable meals served in month t;
- C^f is the claiming rate for free meals, an estimate of the fraction of reimbursable meals served to students eligible for free meals;

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[28]FNS gave a hypothetical example of a school with 70 percent of students eligible for free meals, 10 percent eligible for reduced-price meals, and 20 percent eligible for full-price meals. In this hypothetical school, however, 77.7 percent of meals were served to students eligible for free meals, 10 percent of meals to students eligible for reduced-price meals, and 12.3 percent of meals to students eligible for full-price meals. In this example, the average reimbursement per meal based on the eligibility distribution is $2.17, while the average reimbursement per meal based on the participation (meals served) distribution is $2.36. (In this situation, the school was eligible for the $.02 per meal increment, and the reimbursement rates for free, reduced-price, and full-price meals were $2.70, $2.30, and $.25, respectively.)

[29]A special case of this formula uses the enrollment percentages from the previous formula to estimate the claiming percentages.

- C^r is the claiming rate for reduced-price meals, an estimate of the fraction of reimbursable meals served to students eligible for reduced-price meals;
- $C^p = 1 - C^f - C^r$ is the claiming rate for full-price meals; and
- $BRR^{AEO(2)}$ is the BRR when claiming rates are based on both eligibility and participation.

As indicated by the formula, the BRR does not vary from month to month.

The claiming rate for a category is the estimated fraction of reimbursable meals that are served to students who are eligible for that category, although meals would be provided free to all students. The three claiming percentages are the M_U distribution in Figure 2-1, and, as noted earlier, one objective of the panel was to determine whether there is a reliable and operationally feasible method for estimating this distribution.[30]

ERRORS IN METHODS FOR DETERMINING REIMBURSEMENTS

Both the traditional method and the special provisions and options have limitations that result in errors in determining reimbursements. The limitations associated with the traditional method are described in the following section. The limitations associated with the special provisions are described in the final section.

Traditional Method

Currently, the majority of school districts use what we call the "traditional" method of operating the school meals programs. As described earlier, at the beginning of the school year, the district initiates a process in which parents are asked to apply for free or reduced-price meals by supplying their income and the number of household members or the information required to establish categorical eligibility (e.g., a SNAP case number).[31]

In this process, parents of students who are not directly certified need to apply in order for their children to receive the benefits of free or reduced-price meals. If a family that is eligible for these benefits does not apply and is not identified by direct certification, the students have been denied access to free or reduced-price meals to which they are entitled.[32]

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[30]As shown in Chapter 5, meals served claiming percentages can be expressed in terms of the product of eligibility percentages and participation rates.

[31]An application does not need to be submitted if a student has been directly certified for free meals.

[32]This is not counted as a certification error in official statistics, however.

Even if parents submit an application form for their children, they must complete it correctly. To do so, they must have an accurate understanding of the program definitions of income and membership in the household. When parents are asked to report the number of household members, for example, they need to know that the count does not include foster children living in their household[33] but does include relatives such as aunts or grandparents who are part of a student's economic unit. The parents need to know which forms of income should and should not be included and the correct dollar amounts for included forms. The application process further requires that parents apply these concepts accurately to their individual family situation.

Once an application has been submitted, school or district officials must review it and determine whether the students in the family are eligible for free or reduced-price meals (or must pay full price). Even if the application is completely accurate, errors can be made at this stage in the certification process. Although the required annual verification of a sample of applications may reduce errors in the completion and review of applications, substantial certification errors still remain, as discussed below.

Once a student has been approved for free or reduced-price meals or the application for such benefits is denied and the student must pay full price for a meal, the meal counting and claiming process begins. A school must retain daily records of the number of meals served for each eligibility status by linking a reimbursable meal served to a student and then linking that student to his or her certified eligibility status. The school's daily records are compiled and submitted to the school district, and the school district submits them to the state. The state completes form FNS-10, providing the information that FNS uses to determine reimbursements. At each stage of this process, errors may occur.

The APEC study (U.S. Department of Agriculture/Food and Nutrition Service, 2007b), discussed earlier, found that the certification process is especially prone to error, with approximately 9 percent of total reimbursements for both the NSLP and SBP considered erroneous because of certification errors. The study reported on two sources of certification error: (1) household reporting errors and (2) administrative errors made by districts in processing applications. It established that 23.2 percent of all certified students and denied applicants had household reporting errors on their forms, while 8.3 percent were subject to administrative

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[33]This statement was true when the panel began its work, but the policy has changed. According to U.S. Department of Agriculture/Food and Nutrition Service (2011b), foster children are now to be counted as part of the household.

error.[34] (The two sources of error could occur on the same application and could have been offsetting.) Household reporting error led to over-certification for 13.5 percent of applications and undercertification for 9.7 percent of applications, while administrative error led to overcertification for 6.2 percent of applications and undercertification for 2.1 percent of applications.[35] The most common type of household reporting error was misreporting of total income; this error affected 20 percent of certified students and denied applicants. Eight percent of certified students and denied applicants had errors in the number of household members listed on the form. The most common administrative error was certification of a student as eligible for free or reduced-price meals when the application was incomplete and should have been denied.

According to the APEC study (U.S. Department of Agriculture/Food and Nutrition Service, 2007b:53, vol. 1), roughly 14 percent of those approved as eligible for free meals should have been approved for a status with fewer benefits (8 percent for reduced-price and 6 percent for full-price meals). At the other end of the distribution, 36 percent of students whose applications were denied, and thus were required to pay full price, should have been approved for free or reduced-price meals (19 and 17 percent, respectively). Given the limited income range over which a student qualifies for reduced-price meals, approvals for that category are the most error prone. Roughly one-third of students approved for reduced-price meals should have been approved for free meals, and 25 percent should have had their applications denied.

To quantify the potential effect of certification errors on the distribution of students by eligibility status when the traditional method is used, the APEC study compared the distribution of students based on the categories for which they had been approved with the distribution based on their true eligibility status, using the sample of students who had undergone the certification process and either had been certified for free or reduced-price meals or had their applications denied.[36] The distribution based on approval status was 78 percent free, 17 percent reduced price, and 5 percent full price (U.S. Department of Agriculture/Food and Nutrition Service, 2007b:51), while the distribution based on true eligibility status was 74 percent free, 14 percent reduced price, and 12 percent full price (U.S. Department of Agriculture/Food and Nutrition Service,

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[34]Denied applicants—that is, applicants who are not approved for free or reduced-price meals—can still purchase meals at full price.

[35]Overcertification occurs when a student is certified for more benefits than those to which she or he is entitled. For example, a student approved for free meals is overcertified if she or he should have been approved for reduced-price or full-price meals.

[36]Because estimates were not obtained for students who did not apply, these distributions do not pertain to all enrolled students.

2007b:53). It was also estimated (U.S. Department of Agriculture/Food and Nutrition Service, 2007b:97) that the gross reimbursement error resulting from certification errors in the NSLP was 9.4 percent of total reimbursements (sum of absolute values of overpayments and underpayments divided by total cash and commodity reimbursement). Underpayment due to undercertification offset some of the overpayment due to overcertification, resulting in a net overpayment of 4.8 percent of total cash and commodity reimbursements.

The APEC study also evaluated noncertification errors, classified as cashier or aggregation[37] errors. The study found that the process by which cashiers assess and record whether a meal is reimbursable is a substantial source of erroneous payments, particularly in the SBP, even though most schools had fairly low levels of cashier error. The high aggregate level of cashier error arose from a few large schools having very high levels of this type of noncertification error. However, it was conjectured that automated point-of-sale technology in place in most schools would minimize this type of error.

Provisions and Options

With the traditional method, the accuracy of reimbursements depends on four factors:

1. the correct certification of students as eligible for free or reduced-price meals (certification error);
2. the correct determination that a meal qualifies for reimbursement (cashier error);
3. the correct classification of each student taking a meal by approval category (free, reduced price, or full price) (cashier error); and
4. the summation of counts of meals served over cashiers and days, transmission of the school's meal counts by category to the school district, the state, and the federal government for reimbursement (aggregation error).

For Provisions 2 and 3 and the AEO, these same factors would contribute to errors in the base year. The APEC study found that overcertification rates are higher and erroneous payments due to certification error

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[37] Aggregation error is the sum of three potential errors: (1) the school does not sum meal counts correctly, (2) the school does not report to the district correctly, and (3) the district does not report to the state correctly. The error rate for the first type of error was very small, while the error rates for the second and third types were about 2 percent and 1.5 percent of NSLP reimbursements, respectively. The last two error types typically resulted in an overpayment to the school.

are more common in Provision 2 and 3 schools (in their base years) than in schools using the traditional method. Erroneous payments in the NSLP were approximately 1.75 percent larger for Provision 2 and 3 schools. With these provisions, any overstatement (or understatement) of claiming percentages for the base year will persist through subsequent years of their use until a new base year is established. The APEC study did not differentiate between schools in their first base year and subsequent base years, because the sample of Provision 2 or 3 schools was too small. In subsequent base years, there is likely to be more error because after 4 years of not taking applications, parents and school district staff have become less familiar with the application and verification procedures and less skilled in carrying them out. In light of the ongoing provision of free meals, some parents may not understand why applications need to be submitted, and may not submit applications at all or take the time to complete them accurately. School food service directors participating in the workshop hosted by the panel expressed concern about such problems arising when a new base year is established. Because the AEO has only one base year at the beginning of the process, the challenges associated with subsequent base years will not obtain.

After the first base year, the reimbursements under Provisions 2 and 3 and the AEO include any base-year errors. Under Provisions 2 and 3, a new base year may be established, possibly resulting in increased errors for reasons discussed above. In the years between base years under Provision 2 and after the base year under the AEO, any additional errors due to factors 1 and 3 are eliminated, leaving possible errors in determining that a meal qualifies for reimbursement (factor 2) and in compiling and transmitting the information (factor 4). In the years between base years under Provision 3, any additional errors due to any of the factors are eliminated, although there may be aggregation error in reporting to the district and state. In addition, Provisions 2 and 3 are subject to errors due to the fact that claiming percentages or meal counts are fixed and will not reflect changes in eligibility or participation rates, a source of error that does not arise under the traditional method. Because the recommended procedures for implementing the AEO include a base year only at the beginning of the process, the difficulties associated with redoing a base year after several years of free feeding with no applications will not be encountered. The AEO relies on the ACS for an annual update and thus accounts for changes in a district's socioeconomic conditions, albeit with a lag.

The panel is not aware of an analysis of the accuracy of the CEO and its impact on reimbursements. This special provision is new, having been implemented in three states during school year 2011-2012. Potential errors under the CEO include direct certification errors and errors associated with using the factor of 1.6 to account for eligible students who are not

identified through direct certification (or lists used for identification). As with other provisions and options, errors under the CEO also include errors in counting total meals and compiling and transmitting data. While the CEO may not keep up to date with changes in the economic status of the community, the school district has the option of conducting direct certification in any year and using the new results if they would lead to an increase in reimbursement.

3

Technical Approach

This chapter presents the framework established by the panel for evaluating the use of estimates based on American Community Survey (ACS) data, describes the data and information sources and how they were used, and provides an overview of the panel's evaluation approach. It also presents intermediate results, such as those related to the use of ACS variables to define eligible students. Results of comparisons of estimates from alternative data sources are presented in Chapter 4.

The key variables of interest for this study are the percentages of students eligible or certified for free, reduced-price, and full-price meals and the percentages of meals served to students in each eligibility category. These are the eligibility, certification, and participation percentages shown in Figure 2-1 in Chapter 2. Estimates that can be computed from the ACS are eligibility rates (with eligibility determined using ACS variables), while estimates that can be computed from administrative data are certification rates that reflect students applying and being approved or directly certified through the application, certification, and verification processes. An ultimate goal is the determination of claiming percentages that reflect participation—meals served by category—under a universal feeding option, also shown in Figure 2-1.

While the panel analyzed all eligibility, certification, and participation percentages (free, reduced price, and full price), we focused on the blended reimbursement rate (BRR) described as part of the reimbursement equations presented in Chapter 2. Looking at changes in the free, reduced-price, and full-price percentages individually can be confusing because

they are correlated, making the impact of changes difficult to assess. The advantage of the BRR is that it depends on all three percentages in a way that is of most direct interest to districts. Specifically, it gives the impact of changes in the percentages on the bottom line—reimbursement. In fact, it is the average reimbursement per meal. The BRR is especially useful as a summary measure for ascertaining the differences in reimbursement that result from using different percentage distributions (eligible students, certified students, or meals served) as claiming percentages. Nonetheless, workshop participants told the panel that to consider participating in the ACS Eligibility Option (AEO), they would need to see all estimates (percentages of students eligible for free, reduced-price, and full-price meals) in addition to the BRR and claiming percentages to help them assess whether to adopt the AEO.[1]

The panel's analytical results are focused throughout on school districts in which more than 75 percent of students were eligible for free or reduced-price meals in any school year from 2004-2005 through 2009-2010 because these districts are most likely to be interested in the AEO districtwide. We call these districts "very high FRPL [free or reduced-price lunch]."[2] Table 3-1 shows the distribution of these and other districts by size for all districts that have school meals program certification data for school year 2009-2010 from the Common Core of Data (CCD) and for which the Census Bureau derived ACS estimates. There are 1,291 such districts in the nation (about 10 percent of all districts), which enrolled nearly 13 percent of all students and 22 percent of students certified for

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[1]Many of our analyses examine the individual free, reduced-price, and full-price percentages. As noted, however, the BRR is a useful way to summarize these percentages and focus attention on whether different sets of percentages substantially affect reimbursement, given that the difference of $.40 (currently) between the free and reduced-price meal reimbursement rates is very small relative to the difference of more than $2 between those rates and the rate for full-price meals. Based on the lunch reimbursement rates (with the $.02 increment) for 2010-2011 (see Table 2-6 in Chapter 2), the BRR with free, reduced-price, and full-price eligibility percentages of 80, 5, and 15 percent, respectively, is less than 2 percent higher than the BRR with percentages of 70, 15, and 15 percent, respectively ($2.3510 versus $2.3110). In contrast, the latter is nearly 10 percent greater than the BRR with percentages of 70, 5, and 25 percent ($2.1050). In other words, shifting 10 percent (of students or meals) from the reduced-price category to the full-price category has a much greater effect on reimbursement than shifting them to the free category. The Healthy, Hunger-Free Kids Act of 2010 explicitly acknowledges the BRR as a useful measure for analysis and decision making, requiring states to calculate and disseminate BRRs for districts for purposes of implementing and administering the Community Eligibility Option.

[2]The 75 percent figure was identified as a threshold for potential interest in a universal feeding provision in many phases of the panel's analysis. It is noted in publications by the Food Research and Action Center (see http://frac.org/newsite/wp-content/uploads/2009/05/provision2.pdf). As discussed later, the 75 percent threshold also was mentioned by participants in the panel's workshop and in its survey of Provision 2/3 districts.

TABLE 3-1 Number and Percentage of U.S. School Districts* by Size and Percentage Approved for Free or Reduced-Price Meals

Size		Low FRPL	High FRPL	Very High FRPL
Large	Number of districts	468	305	110
	Percentage of districts	3.6	2.4	0.9
	Percentage of enrollment	24.1	19.2	8.7
Medium	Number of districts	1,415	722	187
	Percentage of districts	10.9	5.6	1.4
	Percentage of enrollment	16.0	8.4	2.1
Small	Number of districts	5,645	3,092	994
	Percentage of districts	43.6	23.9	7.7
	Percentage of enrollment	12.9	6.6	1.9
Total	Number of districts	7,528	4,119	1,291
	Percentage of districts	58.2	31.8	10.0
	Percentage of enrollment	52.9	34.1	12.8

NOTE: FRPL = free or reduced-price lunch.
*All school districts in the United States with Common Core of Data (CCD) free or reduced-price meals certification data for 2009-2010 and American Community Survey (ACS) estimates. Large districts have 1-year estimates. Medium-sized districts have 3-year estimates, but do not have 1-year estimates. Small districts have only 5-year estimates.
SOURCE: Prepared by the panel.

free or reduced-price meals. We also considered districts with more than 50 percent but never more than 75 percent of students eligible for free or reduced-price meals in the school years from 2004-2005 through 2009-2010 because these districts might be interested in the AEO for a subset of schools. We call these districts "high FRPL." There are 4,119 such districts nationwide (32 percent of districts), enrolling 34 percent of all students and 44 percent of students certified for free or reduced-price meals.

The data collected on form FNS-742 (described in more detail later) show that only 431 of these school districts were operating under Provision 2 or 3, not in a base year, in 2009-2010. Of these, 296 were operating under Provision 2 or 3 districtwide, and 135 were operating under Provision 2 or 3 for only some schools. Of those operating under Provision 2 or 3 districtwide, 79 percent had an FRPL percentage greater than or equal to 75, 10 percent had an FRPL percentage greater than or equal to 50 but less than 75, and 12 percent had an FRPL percentage less than 50. Of the districts where Provision 2 or 3 was implemented for only some schools, 32 percent had a district-level FRPL percentage greater than or equal to 75, 45 percent had an FRPL percentage greater than or equal to 50 percent but less than 75, and 23 percent had an FRPL percentage less than 50. We also refer to districts as large, medium, and small, depending on whether they had 1-year, 3-year, and 5-year ACS direct estimates available (population

of at least 65,000); 3-year and 5-year (but not 1-year) estimates available (population between 20,000 and 64,999); or only 5-year estimates available (population under 20,000).

SOURCES OF DATA ON ELIGIBILITY AND PARTICIPATION

The ACS is the only national survey that may be large enough for use in estimating numbers of students eligible for free or reduced-price meals in school districts and school attendance areas under a potential new provision. The panel considered the use of estimates from the ACS in terms of their accuracy, timeliness, and geographic coverage. Assessment of these properties and the development of possible corrections for any shortcomings required comparison with additional data sources and data products. This section begins with a description of the ACS direct and model-based estimates and then describes the other data sources the panel compared with the ACS: the administrative data collected by the Food and Nutrition Service (FNS) in support of the school meals programs, administrative information about schools and school districts collected and provided by the National Center for Education Statistics (NCES) in the CCD, and school-level data provided to the panel by our case study districts. These data sources were used to assess not only any systematic differences between ACS and administrative estimates, but also the precision, temporal stability, and timeliness of ACS estimates for all school districts in the country and for the schools in our case study districts.

The American Community Survey

The ACS is a continuous survey used to collect data on income, family composition, and other individual and household characteristics that previously were gathered once every 10 years from the long-form sample of the decennial census of population. After a decade of testing and development, the ACS became fully operational in 2005 for households; people living in group quarters were added beginning in 2006. With the advent of the ACS, the 2010 census (as will be true of future censuses) included only the short-form items of age, sex, race, ethnicity, relationship to householder, and owner/renter status (see National Research Council, 2007).

The ACS samples about 240,000 housing unit addresses every month from the Census Bureau's Master Address File, for a total of nearly 2.9 million housing unit addresses every year (increased to 295,000 addresses per month in June 2011). Each month, about half of the households receiving a questionnaire in the mail fill it out and mail it back; nonresponding households for which telephone numbers can be obtained are contacted using computer-assisted telephone interviewing (CATI). A one-third sam-

ple (approximately) of the remaining nonrespondents is designated for follow-up using computer-assisted personal interviewing (CAPI). High overall response rates have been achieved for the ACS. The response rate, obtained by adding mailback and CATI respondents together with a weighted estimate of respondents in the CAPI subsample, was approximately 98 percent in 2009.[3]

The goal of the ACS is to provide small-area estimates similar in precision to but more timely than those provided by the census long-form sample. Because the ACS sample is spread out over time, the data must be accumulated over months and years to provide reliable estimates for small areas. In late 2006 (for calendar year 2005), the Census Bureau began releasing ACS 1-year estimates for states, counties, cities, school districts, and other geographic areas with at least 65,000 people. In late 2008, the Census Bureau began releasing ACS 3-year estimates for areas with at least 20,000 people. Finally, in late 2010, the Census Bureau began releasing ACS 5-year estimates for all geographic areas in Census Bureau databases, including block groups, census tracts, small cities, towns, and school districts.

The ACS data provide an opportunity to construct estimates of students who are eligible for free, reduced-price, and full-price meals for the attendance areas of schools, groups of schools, and school districts. Most school districts in the United States are small in population size. Thus of the 13,777 school districts for which ACS estimates were released in fall 2011, only 985 had 65,000 or more residents according to the July 2010 Census Bureau population estimates, and only 3,411 had more than 20,000 residents.[4] Moreover, even in medium-sized and large school districts, attendance areas for individual schools or groups of schools are small. Because ACS estimates are not provided for school attendance areas, estimates for these areas would need to be based on boundary information or lists of census blocks provided to the Census Bureau by a state or local education agency.

Numerous challenges must be addressed before the ACS can be used to derive eligibility estimates and establish claiming percentages for the school meals programs. Five of the most important issues are (1) constructing geographic areas to represent school attendance areas; (2) **determining eligibility** using ACS variables; (3) assessing systematic differences between ACS and administrative estimates; (4) assessing levels of variability, temporal stability, and timeliness; and (5) accounting for participation. Subsequent sections of this chapter address the first two issues and outline the empirical analyses needed to address the last three. Results of the data comparisons and analyses are provided in Chapter 4.

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[3]See http://www.census.gov/acs/www/methodology/sample_size_and_data_quality/.
[4]See http://www.census.gov/acs/www/data_documentation/areas_published/.

Small Area Income and Poverty Estimates (SAIPE) and ACS Model-Based Estimates

The No Child Left Behind Act of 2001 directed the U.S. Department of Education to distribute Title I basic and concentration grants directly to school districts on the basis of the most recent estimates of school-age children in poverty available from the Census Bureau. These estimates, from the SAIPE Program, were first developed in the late 1990s (see National Research Council, 2000a,b) and are currently based on data from the ACS, the 2000 census, the Supplemental Nutrition Assistance Program (SNAP, formerly the Food Stamp Program), aggregated federal income tax data, and a series of statistical models. The 2009 and 2010 SAIPE estimates correspond to 2009-2010 school district boundaries.

Annual SAIPE estimates of related children aged 5-17 living in families with income below the poverty line are used in allocating $14 billion to school districts for Title I of the No Child Left Behind Act.[5] The school district estimation process uses the number of school-age children in poverty in a county estimated from a statistical model and the estimated number of children in households below the poverty line based on federal income tax returns for each school district (or part of a district) in that county. The county-level model combines the results of a regression equation with direct (not model-based) 1-year ACS estimates, controlled to estimates from a state-level model. The county- and state-level regression equations use administrative records data and estimates from the 2000 census long-form sample to predict numbers of school-age children living in poverty for each county or state.[6]

The SAIPE model estimates are produced for a given year with about a 1-year time lag; for example, the 2009 estimates were released in December 2010, incorporating administrative records information for 2008. This timing is only a few months later than the release of direct ACS estimates. As a result, SAIPE estimates are considerably more timely than the 5-year ACS estimates, the only other available option for small school districts. The SAIPE model-based estimates have the advantage of reducing mean-squared error relative to direct estimates for small geographic areas; however, their accuracy depends on the validity of the underlying model and

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[5]Related children are people under age 18 and related by birth, marriage, or adoption to the householder of the housing unit in which they reside; foster children, other unrelated individuals under age 18, and residents of group quarters under age 18 are not considered related children.

[6]It will not be possible to update the 2000 census variables in the state and county models because the 2010 census ascertained only basic demographic information on households, with the ACS obtaining the detailed socioeconomic data formerly included on the census long form.

may vary for different kinds of areas. SAIPE estimates are not available for census tracts or block groups, and they pertain to the official statistical poverty level and not the 130 percent and 185 percent ratios of income to the poverty guidelines that determine eligibility for free or reduced-price school meals, respectively.

The panel collaborated with the Census Bureau, which agreed to adapt the SAIPE approach and provide model-based ACS estimates of the percentages of students eligible for free and reduced-price meals in each school district in the United States and in the school attendance areas in the case study districts. The methodology developed to provide these model-based estimates is described in Appendix C, and the estimates are evaluated in Chapter 4.

Administrative Data

Both FNS and NCES in the Department of Education collect data from school districts nationwide that can be considered a benchmark for comparisons with the estimates from the ACS. FNS has two relevant data collection mechanisms—form FNS-742, School Food Authority Verification Summary Report (information for school districts), and form FNS-10, Report of School Program Operations (information at the state level only). NCES provides detailed information through the CCD, including data on enrollment, number of students certified for free meals, and number certified for reduced-price meals, for all public school districts and public schools in the country. The panel also collected detailed administrative data concerning enrollment, certification, and meals served from our five case study districts.

Form FNS-742[7] collects data on verification activities. With few exceptions, each school district that operates the National School Lunch Program (NSLP) or School Breakfast Program (SBP) must report the information on this form annually. Section I of the form obtains information as of the last operating day in October. Included are the number of schools operating the NSLP or SBP and the enrollment of those schools, the total number of free-certified and reduced-price-certified students, and the number of free-certified students who are separately identified as (1) not subject to verification (directly certified, homeless liaison list, income-eligible Head Start, pre-K Even Start, students in residential child care institutions [RCCIs], and nonapplicants approved by local officials); (2) certified based on a SNAP, Temporary Assistance to Needy Families (TANF), or Food Distribution Program on Indian Reservations (FDPIR) case number submitted on an application; (3) certified based on income

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[7] The form is available at http://www.fns.usda.gov/fns/forms.htm.

reported on an application; and (4) certified in Provision 2 and 3 schools not operating in a base year. The number of reduced-price-certified students also is separately identified for Provision 2 and 3 schools not operating in a base year.

Section II of form FNS-742 provides information about verification. The reported outcomes of verification include no change, responded and changed to free, responded and changed to reduced price, responded and changed to full price, did not respond, and reapplied and was reapproved on or before February 15. For each outcome, three counts are reported: the number of free-certified students based on the SNAP/TANF/FDPIR case number submitted on the application; the number of free-certified students based on income provided on the application; and the number of reduced-price-certified students based on income. The form also collects data on the number of applications and the number of students for each outcome. Data from form FNS-742 are maintained by FNS and are used to prepare summary reports of verification activities.

Form FNS-10 collects state-level counts related to the school meals programs and is completed by state agencies. The form has two parts. Part A, which must be submitted monthly, obtains the number of meals served in the state under the NSLP and SBP by category (free, reduced price, full price), the total number of meals, and the average daily number of meals. This information is used to compute state-level reimbursements for the school meals programs. Part B is to be completed once a year. In October, states report the number of meals served by category in private schools and RCCIs. Also included are counts of public schools, private schools, and RCCIs that participate in the school meals programs (by program) and the enrollment of those schools. For the NSLP, the form shows the number of students approved for free lunches and the number approved for reduced-price lunches.

To complete form FNS-10, a state agency obtains the necessary information from school districts. Data must be kept for 3 years. FNS provides summary information on its website at http://www.fns.usda.gov/pd/cnpmain.htm. Form FNS-10 was the only comprehensive source of participation information available to the panel, but as noted, it is available only at the state level.

The **CCD,** a program of NCES, conducts five census operations annually to collect fiscal and nonfiscal data on all public schools, public school districts, and state education agencies in the United States. It provides an official listing of public elementary and secondary schools and school districts in the nation, which is used to select samples for other NCES surveys, and it provides basic information and descriptive statistics on public elementary and secondary schools and schooling in general. The data, supplied by state education agency officials,

include information about schools and school districts: name, address, and phone number; information about students and staff, including demographic characteristics; and fiscal data, including revenues and current expenditures. Most of these data are obtained from administrative records, presumably the same ones used by states as the basis for completing FNS forms.

For purposes of this study, the most relevant data from the CCD are the school and school district counts of enrolled students and numbers of students certified for free- and reduced-price meals. The CCD also contains demographic variables (race and ethnicity, English-language-learner status) that were used in the panel's analysis.

Case Study Districts

The panel invited six school districts to participate in this study as case studies, and five agreed. A district could be considered for participation if it had taken applications for the school meals programs for all schools in the district for the past 5 years, had no outstanding counting/claiming issues, was willing and able to provide digitized boundaries for the attendance areas for each school, and was willing to provide an extensive amount of school-level data for up to 6 school years.

The panel decided that case studies should be selected from districts with "medium need," that is, free or reduced-price percentages of 50 to 75 percent. Another criterion was that the districts should be "heterogeneous," that is, have at least 25 percent of schools with free or reduced-price percentages of more than 75 percent and at least 25 percent of schools with free or reduced-price percentages of less than 50 percent. The intent was to identify school districts that were likely to consider adopting the AEO for only a subset of schools. From among such districts, we wanted ones that varied in terms of enrollment but were not so small that estimates for schools or groups of schools would be too imprecise. As a rough guide, we chose to consider only the 65 medium-need, heterogeneous school districts with enrollment greater than 12,000 students based on CCD data for 2007-2008. Within this group, we planned to select 4 large school districts (enrollment of at least 25,000) and 2 medium-sized school districts (enrollment between 12,000 and 25,000). The resulting list of potential case study districts was further refined on the basis of diversity in the aggregate level of need for free and reduced-price meals, diversity in the pattern of heterogeneity of need across schools, available information about state and district management and program operations, geographic diversity, and diversity in the race and ethnicity of students. The five school districts listed in Table 3-2 agreed to participate as case study districts: Austin, Texas;

TABLE 3-2 Case Study Districts

School District	Number of Participating Schools	Number of Students (in thousands)	Students in Schools Without Boundaries (percentage of enrolled)*
Austin, Texas	114	83	3.0
Chatham County, Georgia	46	35	5.4
Norfolk, Virginia	56	36	10.0
Omaha, Nebraska	86	47	4.6
Pajaro Valley, California	32	19	7.4

*Omaha and Chatham County are also open enrollment districts. In open enrollment districts, many schools have geographic boundaries, but students are not required to attend neighborhood schools.
SOURCE: Prepared by the panel.

Chatham County,[8] Georgia; Norfolk, Virginia; Omaha, Nebraska; and Pajaro Valley, California.

The panel contacted state directors in the states of the potential case study districts to describe the study and ask for their assistance. With the approval of state directors, we contacted school district staff. To facilitate the development of the case studies, we obtained the support of the School Nutrition Association (SNA). The president of SNA, Dora Rivas, wrote a letter in support of the study that was included with our letters to state directors and to school district officials.

From each case study district, the panel obtained digitized boundaries for school attendance areas for the most recent school year and detailed data for each school on enrollment, students approved for free and reduced-price meals, and reimbursable meals served under the SBP and NSLP by category for up to six school years. These data enabled us to conduct a limited analysis of the boundary information, to compare school-level data with CCD data for the same school, and to compare school-level data with ACS estimates to evaluate systematic differences and precision. We also used the case study data as part of our evaluation of the relationship between eligibility and participation as the basis for claiming percentages for reimbursement under the AEO and to illustrate how the AEO might work in practice. Appendix E, Part 1 describes the data collected from the case study districts and provides summary information. In addition to providing data and collaborating with the panel, the school food authority directors of the case study school districts were invited to participate in a workshop held in Washington, DC, in March 2011. The agenda for the workshop is provided in Appendix E, Part 2.

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[8]The Chatham County School District is named Savannah-Chatham County Public School System on its public website.

CONSTRUCTION OF EVALUATION DATABASES

The school district-level evaluation database used by the panel consists of school district-level ACS direct estimates and ACS model-based estimates that the Census Bureau provided to us, together with district-level data we obtained from the CCD and form FNS-742.[9] The database includes all 13,527 school districts with both ACS 5-year estimates and ACS model-based estimates. Merging ACS estimates with the CCD data was straightforward because the Census Bureau used the NCES ID to identify school districts. However, not all school districts are included in the Census Bureau's Topologically Integrated Geographic Encoding and Referencing (TIGER) files.[10] Additionally, 41 districts had ACS direct estimates but were not in the CCD, and 227 districts had ACS model-based estimates but no 5-year ACS estimates.[11] Merging with form FNS-742 data was more challenging because the ID numbers in that file vary by state and over time and are often different from NCES IDs. A recent study documenting the linkage between the FNS-742 and CCD districts in the country was helpful to the panel.[12]

The final school district-level evaluation database includes enrollment and eligibility percentages and their standard errors from ACS direct 5-year estimates (2005-2009), together with five 1-year model-based ACS estimates for calendar years 2005 through 2009 for each school district in the database. For districts with populations greater than 20,000, the database also includes three ACS direct 3-year estimates (2005-2007, 2006-2008, and 2007-2009), and for districts with populations greater than 65,000, it includes five ACS direct 1-year estimates (for 2005 through 2009). Included as well, when database records could be linked, are FNS-742 annual data for school years 2004-2005 through 2009-2010, including Provision 2 or 3 participation (not in a base year) indicators, enrollment, and percentages certified by category, along with information on categorical

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[9]The data set is named District Data School Meals.xlsx.

[10]TIGER is the database that associates codes for school districts and other political and statistical geographic areas with street segments and address ranges.

[11]The Census Bureau withheld ACS estimates for some districts—probably small districts—because of disclosure concerns. Estimates were not withheld for any other reason (e.g., inadequate precision). No ACS model-based estimates were withheld.

[12]*VSR-CCD Linkfile*, a report delivered to FNS by Mathematica Policy Research on May 21, 2010, was provided to the panel by FNS. (VSR stands for Verification Summary Report.) The project director was Nancy Cole. The report notes reasons for differences between VSR (from the FNS-742) and CCD data. Although usually there was a one-to-one match, the primary exceptions occurred when school food authority (SFA) operations were centralized for multiple school districts. Examples where this was common include Montana, New Hampshire, and New York City. In 2008-2009, there were 14,717 (unduplicated) SFAs in the VSR file, and 95.5 percent of these matched with the CCD data.

eligibility and verification outcomes. The database includes the following CCD data for each school district for each school year from 2004-2005 through 2009-2010: enrollment; percentages certified by category; demographic information, such as the racial/ethnic distribution of students; the prevalence of English-language learners; enrollment in the district's magnet and charter schools; and several measures of a district's proximity to charter schools that are independent of the district. The school district database is available from a Committee on National Statistics website (http://sites.nationalacademies.org/DBASSE/CNSTAT/Using_ACS_ for_School_Meals/index.htm).

The panel created the school-level evaluation database[13] by merging the ACS 5-year estimates for 2005-2009 and five 1-year ACS model-based estimates (for calendar years 2005 through 2009) with the school-level data provided by the case study districts for school years 2003-2004 through 2008-2009 and with the CCD school-level data for 2004-2005 through 2008-2009. This analysis file includes only those schools in the case study districts that had school attendance boundaries in 2009-2010 (the date of the boundary file), passed the Census Bureau's disclosure review, and were in operation during at least 2008-2009, the last year for which data were collected from the case study districts. An alternative data file[14] was prepared that contained the school-level data provided by the case study districts for the schools for which no ACS data were provided (including schools without boundaries, schools that closed prior to 2008-2009, and schools withheld by the Census Bureau because of disclosure concerns). This last file also includes CCD school-level data for the same years.

SOURCES OF INFORMATION FOR DESIGNING AND IMPLEMENTING AN ACS ELIGIBILITY OPTION

The panel used three sources to gather information about the challenges associated with managing the school meals programs and attitudes regarding special provisions. These sources helped us develop details of the AEO. The three sources were a workshop with selected school food authority directors, a survey of Provision 2 and 3 school districts, and a wealth of information from the school food authority directors of the case study districts.

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[13]Data set named District_ACS_SAIPE_CCD_schools_Master.V2.xlsx.
[14]Data set named District_CCD_schools_05252011.xlsx.

Workshop

On March 3-4, 2011, the panel hosted a workshop in Washington, DC, with school food authority directors from the case study districts and with selected other individuals from the school food community who had insights to offer regarding Provision 2 and the school meals programs more generally. The purpose of the workshop was to help us better understand issues pertaining to a potential new provision for the school meals programs and the information school districts would need to determine whether to adopt this special provision. The workshop agenda appears in Appendix E, Part 2. Key observations from workshop participants follow. Note that although the workshop participants were highly knowledgeable about the school meals programs, their observations reflected their personal opinions and individual experiences rather than a consensus of the group. Moreover, their observations may not be representative of those that would be expressed by other school food authority directors.

The district representatives said they are keenly interested in increasing participation in the school meals programs, and one way to do so is to offer free meals to all students. Participation in the programs in elementary schools is already high, so the greatest potential for increased participation is in middle and high schools. To increase participation, a district must improve the image of school meals. Universal feeding likely reduces stigma, contributing to increased participation.

Several participants said there are economies of scale in offering meals and that a district can usually handle increased participation up to some point with the same seating capacity, staff, and equipment. Up to that point, there is an increase in the total cost of providing meals, but the average cost per meal goes down because the only increase in cost is for extra food. After that point, however, other costs may increase (the district may need more labor, expanded facilities, etc.).

Some districts provide universal free feeding without operating under Provision 1, 2, or 3. Typically, they do so to increase participation. The Chatham County and Denver school districts have implemented universal free feeding in some schools. Chatham's implementation of free breakfasts in high schools reportedly increased participation. Denver instituted universal free feeding on November 1, 2010. The executive director of enterprise management for the Denver public schools stated that participation by students paying full price has risen by 6 to 9 percent, and participation by those certified for free meals has risen by 10 to 12 percent; however, participation by students certified for reduced-price meals has risen by only 1 or 2 percent.

Workshop participants agreed that having 75 percent of enrolled students certified for free or reduced-price meals is a reasonable estimate for

the break-even point[15] for Provision 2 (although at least one person suggested that this figure might be a little higher—80 percent). At or above that level, the additional costs of feeding all students for free are expected to be offset by savings associated with elimination of administrative processes associated with the traditional school meals programs. Below that level, it becomes more challenging to offset the additional costs of providing universal free meals.

Workshop participants noted that the panel would have to be careful in describing differences between ACS and administrative estimates to ensure that these differences would not be interpreted as indicative of widespread fraud in the application process. They also advised that the panel would need to provide a clear and convincing discussion of the accuracy of ACS data if it were to suggest that these data would be used in the AEO. Another issue raised was whether ACS data would be deemed accurate enough for use as a replacement for the data on free or reduced-price certification percentages that are used by districts for allocating Title I funding to schools and in administering other programs.

Further, participants noted that the panel would need to address whether the ACS includes certain populations, such as migrant workers, refugees, the homeless and runaways, and military families. Pajaro Valley, for example, has a large migrant population that resides in the district only from May through October. Some of the migrant children are likely to live in migrant camps that are not included in the ACS household population. The director expressed concern about how well the ACS captures these children if the migrant population is afraid of the census and does not participate in the ACS.[16]

Participants were concerned about the time frame of the ACS data and about being locked into percentages that do not reflect current circumstances. They raised questions about the quality of income data reported in the ACS and how well the ACS can account for changes over time and in geography. Economic conditions can change rapidly, and attendance areas can change when there is a shift in population or a district opens new schools or closes old ones. Traditional application and certification procedures can easily capture these changes.

Participants stressed that anything that impacts funding should be

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[15]The term "break-even point" may not be entirely accurate. The panel was unable to find any evidence that a cost-benefit analysis was used to determine this point, and in fact had difficulty in collecting consistent information about the costs of the administrative processes that are eliminated under Provisions 2 and 3, the AEO, and the Community Eligibility Option.

[16]Refugees are usually settled in regular housing, where they would be captured by the ACS during the time they are in the district. However, some might choose not to participate in the ACS. The ACS includes all military personnel in the United States and their families, whether living on or off base.

effective at the beginning of a school year. Most school district budgets are developed in winter/spring (December-February) for the following school year. Reimbursement rates are available from FNS in July. Participants said they need to know the claiming percentages at the latest by July but would like to have them sooner.

Census Bureau staff participating in the workshop noted that school meals program eligibility estimates from the ACS for a particular calendar year or period (e.g., 2010, 2008-2010, or 2006-2010) could be made available within a little more than a year after the end of data collection (i.e., early 2012 for the years listed). They noted further that the school district-level data products they regularly prepare from the ACS for NCES are delivered in February-March, so most likely that would be the timing for ACS-based AEO tabulations as well.

Despite their concerns about having estimates that reflect current conditions, participants agreed that substantial variation in claiming percentages over time would be a problem for administering the school meals programs. They would prefer less variation even if the data were older and less responsive to change. Moreover, if the average reimbursement implied by the claiming percentages were to decrease because of improved economic conditions or other reasons, they would prefer steady, smaller decreases rather than a constant average reimbursement followed by a significant drop (as under the current Provision 2 when a new baseline must be established). Participants said that school districts would decide whether to adopt the AEO by "doing the math." Districts would first determine whether the AEO might increase participation in targeted schools of interest to them. They would then evaluate the data to determine the impact on their budgets and whether they could afford the likely increased participation. This evaluation would include determining whether state requirements could be met and whether the district could accommodate increases in participation. Districts would need to make sure that à la carte food offerings or catering would provide enough money to pay any difference not covered by administrative cost savings. The concern of any district would be, "Would I lose money?" Some districts would initially consider the AEO for breakfast only.

Districts would want to have estimates of percentages eligible by category and estimated claiming percentages (if different from percentages eligible). They would need percentages eligible to report to the state—for example, for Title I. They would also need these numbers to convince themselves that the quality of the estimates was acceptable. They would need the claiming percentages (if different) to assess changes in revenue. One participant suggested that FNS implement the AEO as a demonstration or pilot program.

Participants stated that the panel's presentation on geography and the

issues raised on the subject were outside their technical capabilities. The Census Bureau already has boundary information for all school districts, so if a district wanted to participate in the AEO districtwide, geographic boundaries would not be an issue. If districts wanted to participate in the AEO for some but not all of their schools but had to pay to have school attendance boundaries prepared, it would be very difficult for them to participate. Some workshop participants already knew where (in the local government) to obtain geographic boundaries for schools, while others had no idea how to begin looking. Representatives of participating districts expressed interest in a web application, believing that they might be able to have a staff person use it.[17] (See the discussion of the School Attendance Boundary Information System [SABINS] later in this chapter.) In summary, obtaining geographic boundaries for groups of schools might be a challenge for some districts, but not all.

Survey of Provision 2 and 3 Districts

The panel conducted a survey of school food authority directors in school districts that reported operating under Provision 2 or 3. The purpose was to ascertain the advantages and disadvantages of these provisions from their point of view and to see whether they had data they were willing to share that would help us identify changes in participation because of providing universal free meals. Details concerning the frame construction, pilot test, and survey are provided in Appendix E, Part 3.

This survey was a "target of opportunity" and cannot be viewed as representative of all school districts that operate under Provision 2 or 3. However, observations made by multiple respondents are likely to be commonly held views. The panel was fortunate to have the cooperation of SNA for our study. In addition to providing a letter of support for our initial recruitment of case study districts, SNA supported this survey and provided a database entitled SNA.Provision123.data, an extract of names of participants from its recent conferences who reported that their districts participate in Provision 1, 2, or 3. The panel used this database as the sample frame for the pilot test. The pilot test involved conducting telephone interviews with 10 of 12 school food authority directors selected from the SNA list. After being refined in accordance with results of the pilot test, the survey was administered via SurveyMonkey on the Internet. The

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[17]The School Attendance Boundary Information System (SABINS) project has been working to develop a web-based digitizing application. As of April 2012, the application was still in testing. SABINS is now funded by NCES, which will host the final version of the remote digitizing service. NCES also plans to update SABINS annually and gradually increase its geographic coverage.

sample frame for the main survey was based on the FNS-742 data, which yielded 287 districts with enrollments of at least 500 that reported operating under Provision 2 or 3 (not in a base year) during 1 to 4 of the past 5 years.[18] Working with its regional offices, FNS provided e-mail addresses for 100 of these districts, each of which was invited to participate in our survey; 22 districts completed the Internet survey.

Of the 10 districts participating in the pilot survey, 1 had not implemented a special provision and was out of scope, 3 were using Provision 2 for breakfast only, and 6 were using Provision 2 for both lunch and breakfast; none was using Provision 3. The number of schools in these districts ranged from 10 to 140, with an average of 41. Enrollment ranged from 5,400 to 89,000, with an average of 30,000. Of the 22 Internet survey respondents, 1 had not implemented a special provision and was out of scope; 1 reported that it had used Provision 2 in the past but could no longer afford to participate because of district finances; 1 reported that it used Provision 2 for breakfast only; and the others reported that they used Provision 2 or 3 for both breakfast and lunch. (Three stated that they used Provision 3, and 1 that it used both Provision 2 and 3. However, none of the districts reported the number of schools using Provision 3, so it is possible they did not understand the distinction or were no longer using a special provision.) Eleven indicated that they had implemented Provision 2 districtwide. About 10 districts said they had data demonstrating changes in participation due to the implementation of Provision 2, and about half of them provided those data to the panel. The number of schools in the 22 districts ranged from 2 to 90, with an average of about 16. Enrollment ranged from 1,100 to 49,000, with an average of about 8,300.

Respondents indicated that the percentage of students certified for free and reduced-price meals that triggered the adoption of Provision 2 was high. One district used the severe need breakfast cut-off (60 percent), another used 70 percent, and others used 75 percent or more. The provisions were applied most commonly in elementary schools and special high schools (where one motivation appears to be to avoid handling cash). One district respondent mentioned the geographic proximity of the schools considered for Provision 2, while another noted political ramifications if not all schools participated.

A wide range of advantages and disadvantages of Provision 2 were identified. Respondents noted the following advantages, but no respondent mentioned all of them: faster serving lines, less paperwork and labor, no applications, good for students (less stigma), no money handling, participation increases, students no longer need ID cards or money, no dun-

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[18]We wanted to identify districts that had conducted a recent base year in hopes of obtaining base-year data.

ning of parents whose children cannot pay, and ability to serve breakfast in the classroom. Districts using Provision 2 for only some schools still had to carry out administrative processes associated with applications for the remaining schools, so the reduction in paperwork and labor was less than for districts using Provision 2 districtwide.

Disadvantages cited included the following (although some respondents said there were no disadvantages): revenue decreases, a large amount of base-year record keeping, administrative glitches requiring attention (students changing schools), and claiming percentages being fixed at the base-year level and not reflecting changes in participation or demography. There were also comments about problems in obtaining completed applications in nonprovision schools and the resulting difficulty of collecting meal charges from parents who had not filed applications but whose children ate the meals.

Districts do occasionally take schools off of Provision 2. Reasons given included the free or reduced-price percentage falling below a threshold, school closings and relocation of students, and district finances.

Most respondents said they believe they have lowered their administrative costs by operating under a special provision. However, few districts had quantified their administrative savings. Although they could cite reduced labor hours, most districts did not appear to have gained significant savings. Breakfast-only implementation appears to have more to do with hunger prevention and nutrition goals than with administrative efficiencies.

Other uses cited for the data on student certification varied considerably. Common uses included aggregate reporting needed for Title I funding under the Elementary and Secondary Education Act (ESEA), as amended, and individual data used as socioeconomic indicators linked to test scores for reporting under the No Child Left Behind Act (NCLB) Other respondents mentioned grants or district needs for the data for waiving or reducing various student fees. Programs that used the aggregate numbers were cited more frequently than those that used individual family status; in the latter case, the need appeared to be mainly for obtaining fee waivers. Some respondents reported use of a separate family application process to secure Erate funding.[19]

District directors noted that state agencies did not appear to be proactive in promoting implementation of the special provisions or in offering

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[19]The Schools and Libraries Program of the Universal Service Fund, commonly known as "E-Rate," is administered by the Universal Service Administrative Company under the direction of the Federal Communications Commission, and provides discounts to assist most schools and libraries in the United States in obtaining affordable telecommunications and Internet access. See http://www.universalservice.org/sl/about/overview-program.aspx.

technical assistance. They suggested that the panel consider recommending that FNS and states provide sufficient technical assistance should the panel recommend implementing a new provision.

Additional Information from Case Study Districts

In addition to providing the information formally requested of the case study districts and participating in the panel's workshop, the case study school food authority directors responded to many additional questions we posed as we attempted to understand the data on and processes of the school meals programs. We are grateful for their assistance. They provided input concerning the percentage of applications received by October of each year (about 90 percent, but sometimes less if the region has an economic downturn, a factory closing, or many migrant workers). Pajaro Valley provided some detail about its large number of migrant students. Omaha, an open enrollment district, provided spreadsheets showing counts of students and free and reduced-price percentages by both school catchment area residence and school attended so we could consider the impact of open enrollment. Case study directors helped us work through complexities in the data and provided examples illustrating potential causes: for example, students assigned to a school sometimes attend a different school for part of the day and receive lunch there; some districts provide school meals for children of students (not included in enrollment counts); and some districts provide Head Start programs that may move to different schools in different years.

FRAMEWORK FOR EVALUATING THE USE
OF ESTIMATES BASED ON ACS DATA

This section considers the suitability of estimates for the school meals programs under an AEO from the perspective of their fitness for use. The panel applied four main criteria in evaluating the use of ACS data in support of the school meals programs:

1. conceptual fit,
2. accuracy (systematic differences and precision),
3. temporal stability, and
4. timeliness.

Conceptual fit addresses possible discrepancies between the concepts behind estimated claiming percentages and those behind the authorizing legislation and regulations of the school meals programs. In particular, conceptual fit relates to how well ACS variables can be used to define stu-

dents eligible for free or reduced-price school meals. *Accuracy (systematic differences and precision)* was addressed by comparing ACS estimates with administrative data[20] to determine whether systematic differences exist and whether and in what situations the error from using the ACS is comparable to that associated with existing practices and provisions. *Temporal stability* and *timeliness* also were addressed by comparing ACS estimates with administrative data to assess whether ACS estimates would be sufficiently stable while maintaining adequate responsiveness to changes in socioeconomic conditions. These comparisons considered how the estimates would be used in practice and what the context of the decision processes affected by the estimates would be.

In applying this framework, the panel recognized that no system for determining claiming percentages for reimbursement for school meals is perfect. We sought to identify the best method possible, not only from an error perspective but also from the viewpoint of reducing the costs and burden associated with administering the school meals programs, as well as improving access to the programs by the nation's schoolchildren.

The quality of an estimate has many determinants, including the data sources used as inputs and the underlying methods used to generate the estimate. Survey estimates, for example, are subject to errors that arise in the process of sampling a population, obtaining data from the sampled households, and processing the collected data to create a data set for analysis. Errors in administrative databases used for model-based estimation arise from the fact that these databases generally were not created to be analyzed as a whole, but to manage individual cases. Attention has seldom been given to editing administrative data in a unified way, so there may be data entry or other errors. A survey or administrative database will record information on variables to measure concepts that are developed for specific applications, and these variables may not match the programmatic intent of the school meals programs. Another part of the process involves identifying which records in a database are associated with the school district or school based on some geographic domain, and error can occur here as well. Finally, when estimates for small populations, such as small school districts or individual schools, are needed, the estimation method almost certainly involves some form of statistical model that specifies a structure to approximate—with error— the observed relationships in the population.

While this list of error sources may appear extensive, the current procedures for certification and meal counting in the school meals programs are subject to their own errors associated with administrative processes that

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[20]While the panel compared ACS data with administrative data, it should be noted that the administrative data also are subject to error.

involve parents, students, lunch room staff, and office staff. As described in Chapter 2, the Access, Participation, Eligibility, and Certification (APEC) Study (U.S. Department of Agriculture/Food and Nutrition Service, 2007b) showed that the error rates and costs associated with these processes can be large.

APPROACH TO DEVELOPING ACS ESTIMATES

Before estimates can be evaluated, they must first be developed. Hence, the first task facing the panel was to decide how to use the ACS to provide estimates of percentages of students eligible for free and reduced-price meals under the school meals programs. This task had two distinct activities: defining geographic regions for which estimates are needed and considering the combination of ACS variables that best identifies students eligible for school meals. This work led to the panel's conclusions concerning ACS definitional issues and resulted in the specifications we provided to the U.S. Census Bureau (see Appendix D). This section describes the development of specifications; the next section describes our approach to evaluating the direct and model-based ACS estimates.

Developing Specifications for Geographic Areas

For the ACS and other surveys conducted by the Census Bureau, the corresponding geographic support is provided by the Census Bureau's TIGER database, a digital map of streets, boundaries, and other features. The accuracy of TIGER was recently substantially improved through a major initiative in preparation for the 2010 decennial census, so that positional errors are now in the 5 meter range for streets and other major features. Geographic areas that are available in TIGER include blocks, block groups, census tracts, school districts, small cities, towns, counties, and states. The Census Bureau routinely provides detailed demographic data for school districts, as well as for higher levels of geography.

The Census Bureau's SAIPE program manages the School District Review Program, which was completed most recently in 2010, to keep the geographic boundaries of school districts up to date. During the update, the Census Bureau works with states to provide updates for the school districts within the state. The next update will be completed in 2012. This state-level approach relies on collaboration between the state and local school districts to keep track of boundary changes made at the local level. The panel found, however, that local school district boundary changes occasionally are not recorded in TIGER. For example, in Pajaro Valley Unified School District in California, one of our case study school districts,

the TIGER district boundary was different from the actual current school district boundary, leading to inevitable differences in demographic data.

To obtain the estimates for school attendance areas needed for this study, the panel had to obtain digitized school attendance area boundaries from the case study districts. We were fortunate to be able to work with the SABINS project (National Science Foundation, 2009), an effort led by principal investigator Salvatore Saporito that received funding from the National Science Foundation in 2009. The project has established a spatial database of school attendance boundaries for the most populous school districts in the country. SABINS data are distributed via the National Historic Geographic Information System website, see http://www.nhgis.org/. The boundaries provided through SABINS are compatible with the TIGER database to facilitate social science research. As of early 2012, SABINS provided school attendance boundaries for the 600 largest U.S. school districts, all districts embedded in three states (Delaware, Minnesota, and Oregon), and all districts embedded in 11 metropolitan areas.

The panel received digitized boundaries from our case study districts, and SABINS independently obtained boundary information for these districts. For each district, SABINS used the boundary information to construct a database for each grade (K-12), integrated with information from the CCD, and uniquely identified the census blocks associated with each school attendance area. SABINS provided the databases for the case study districts to the Census Bureau on behalf of the panel. The Census Bureau produced estimates for these school attendance areas by aggregating block-level data associated with each school attendance area.

SABINS encountered several challenges in the collection of school attendance boundaries. Some districts maintain detailed, accurate boundaries for all schools and all grades in digitized form in geographic information systems (GIS). In these cases, the acquisition of boundaries by SABINS was straightforward. In other cases, however, there appeared to be a lack of coordination among different district agencies—for example, the version of the school attendance boundaries used by the transportation office might differ substantially from that used by other offices. In other cases, maps might exist only in rough form on paper.

The panel considered several approaches by which school districts could transfer information on school attendance area boundaries to the Census Bureau as part of the AEO, with a view to determining which approach would be most accurate, easiest for school districts, and most efficient for the Bureau to use in tabulating data for schools. We determined that the best approach would be block rectification, the method adopted by SABINS. The process of block rectification assigns each census block entirely to a school attendance area (or not). In other words, blocks are not split between two (or more) school attendance areas. This opera-

tion is easily performed in a GIS. The Census Bureau agreed that block rectification is also the most efficient approach for it to use.

In the panel's interim report, we discussed efforts we might undertake should there be a need to split blocks (National Research Council, 2010). If a boundary splits a block, an error is associated with assigning the block to just one school, since the portion of the block not contained within that school's attendance area will be incorrectly assigned to it. Alternatively, one might attempt to estimate the proportion of a split block's students that should be assigned to each of the schools whose boundaries split the block. For example, one might estimate that 30 percent of the block's students are in one attendance area and 70 percent in another. Such estimation processes are known as areal interpolation (Goodchild and Lam, 1980). Saporito and Sohoni (2006, 2007) collected maps for the schools in the 21 largest school districts and computed estimates for race and ethnicity (available at the block level) and for income eligibility for free and reduced-price school meals (available only at the block group level) from the 2000 census. They observed that "unlike blocks, block groups do not nest neatly within school attendance boundaries but, in fact, cut across them in unpredictable ways" (Saporito and Sohoni, 2007:1,231-1,232). They used areal interpolation of block group data to school attendance areas and found that "the correlation between estimated and actual percent of white children in school attendance boundaries was .999 based upon all attendance boundaries in the study" (Saporito and Sohoni, 2007:1,247).

The Austin Independent School District provides a convenient example with which to illustrate the errors associated with block rectification and obtain quantitative estimates of their magnitude. Figure 3-1 shows elementary school attendance areas overlaid on 2010 census block boundaries; census blocks that straddle boundaries are shaded green. Figure 3-2 shows split blocks overlaid on an aerial image; the large split block in the lower center is composed largely of an airport. We found that split blocks often are unpopulated, an observation that is consistent with the first of these figures, where split blocks lack the dense street patterns characteristic of populated areas.

To obtain a quantitative estimate of block rectification error, we examined a random sample of 35 of the 678 Austin blocks that are split by elementary school boundaries. Of the 35, 20 have zero population. Thus, an estimated upper bound on the rectification error can be computed by taking the fraction of blocks that are split times the fraction that have nonzero population, that is, (678/9,724) * (15/35) or 3.0 percent. From this analysis, it appears that at most 3.0 percent of the elementary school population of Austin may live in a block that is split by an elementary school boundary. Only a subset of these children would be misassigned as
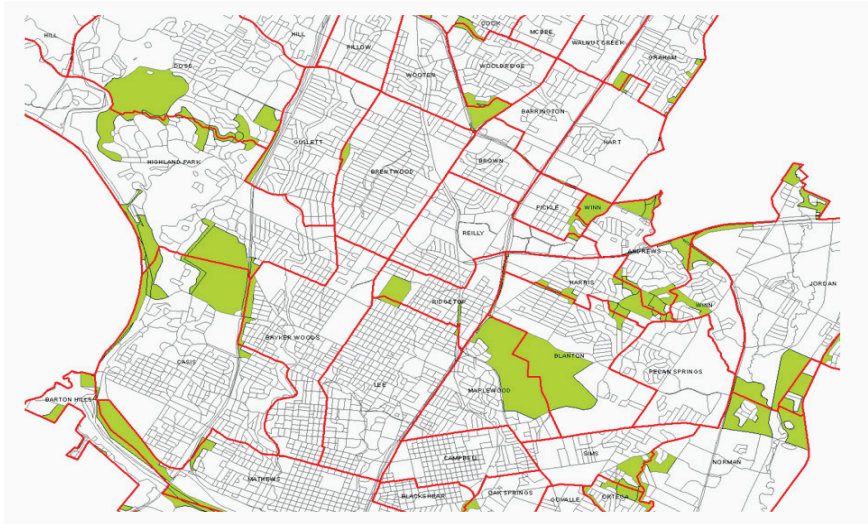
FIGURE 3-1 Illustration of split blocks: School attendance areas and census blocks in Austin, Texas.
NOTE: School attendance boundaries are shown in red; split blocks are shaded green.
SOURCE: Prepared by the panel.

FIGURE 3-2 Illustration of split blocks: Aerial view of school attendance areas in Austin, Texas; close-up of areas surrounding airport.
NOTE: School attendance boundaries are shown in red.
SOURCE: Prepared by the panel.

a result of block rectification. We caution, however, against generalizing too broadly from this simple analysis of one school district.

The SABINS project provides block-rectified lists for the school attendance areas in many of the country's districts for school year 2009-2010. If available for a district, these are sufficiently accurate for use in the school meals programs and would be an easy way for a district to obtain the needed geographic data. The Minnesota Population Center has received support from the National Science Foundation to maintain the SABINS data, and some work is continuing. In early 2012, the panel learned that the SABINS project will be taken over by NCES and ultimately expanded. One of the potential issues associated with using SABINS is that it includes boundary information associated with grades K-12. If a district needs boundary information for prekindergarten grades and they differ from those associated with other grades, these boundaries will not be available from SABINS. SABINS did include most prekindergarten grades in support of this study.

Using the ACS to Determine Eligibility for School Meals

When conducting a survey, one generally is interested in collecting data on a specific concept, even if one cannot always directly observe that concept. Specification error arises when the question or measurement method does not match the target concept. For this study, the panel interpreted specification error somewhat differently: we looked at specific questions in the ACS with respect to the concepts associated with school meals eligibility criteria (e.g., income and reporting unit) compared with the original target concept the survey question was designed to measure. Another example of specification error in our application pertains to the timing of the data. For example, the ACS collects public school enrollment data for the last 3 months and income for the last 12 months from the date the questionnaire is completed, while school meals administrative data are typically dated October 31 of the school year.

A concept related to specification error is measurement error, which arises in the response process. There are many potential sources of measurement error, depending on the type of question. For example, a respondent may have difficulty understanding or be inattentive to the correct meaning of the question; have trouble recalling past events or estimating such items as income in accordance with the questions' definitions; or provide erroneous answers because of social desirability pressures, perceived stigma, or privacy concerns when answering sensitive questions, such as those about income and program participation.

In considering specification and measurement errors, the panel focused on variables used to estimate eligibility: income, relationships

within the household, program participation (SNAP, public assistance), school status, grade, and age. Using annual aggregate income for the U.S. population as a measure, Czajka and Denmead (2008) found that the ratio of the ACS estimate to the Current Population Survey (CPS) estimate was between .995 and 1.006 for the three lowest income quintiles (the income range of greatest interest to this study), a much narrower range than the three other major household surveys used in their comparison.[21] However, the annual figure averages over monthly income fluctuations and, as noted later in this chapter, is likely to indicate as ineligible some students who would be eligible for free or reduced-price meals based on monthly income values (U.S. Census Bureau, 1998). Relative to program eligibility criteria, moreover, household relationships are not completely ascertained in the ACS, and in some situations, such as with multiple family units living in a housing unit, the identification of a household for purposes of eligibility determination may be incomplete. Although the ACS includes a question on SNAP participation during the past year, public assistance programs providing cash income are lumped into a single question, and only some of those programs confer categorical eligibility for free meals. There is also evidence that program participation is underreported in the ACS.[22]

A key task for the panel was to determine how data collected in the ACS can be used to reflect the eligibility criteria of the school meals programs. This task has several different issues to address: (1) how to use ACS variables to identify public school students, (2) how to apply income eligibility guidelines to determine eligibility, (3) how to define income for purposes of evaluating eligibility for school meals, (4) how to group individuals in households to define a student's economic unit for school meals eligibility, and (5) how to identify categorically eligible students using ACS variables.

Definition of Public School Students

The ACS collects information on school attendance: whether attending within the last 3 months, public or private school, and grade (or grade range). The ACS also collects information about students' age. Hence for

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[21]They used the CPS as a standard because it is the official source of household income and poverty measures for the United States and provides a useful standard.

[22]Czajka and Denmead (2008:170) report, "As a rule surveys underreport numbers of participants in means tested programs, so in comparing estimates of participation across surveys, more is generally better." Of the surveys they examined, the Survey of Income and Program Participation (SIPP) had the highest number, 31.4 million people (or 11.2 percent of the population), in families receiving welfare or food stamps at any time during 2002. The ACS was second, with 24.5 million people or 8.8 percent of the population.

persons in ACS data files who reside in a given public school district or public school attendance area, the Census Bureau can identify those who are less than 20 years old, do not have a high school diploma or general educational development (GED) credential, attended public school within 3 months of the ACS interview, and are in the appropriate grade range. Given the grade range of the school, the total number of such students is an estimate of the number of enrolled students in a calendar year. Most of these variables are not thought to be subject to substantial measurement error; however, there may be specification error in the assignment of students to school years and to districts and schools.

Income Eligibility Guidelines

Income eligibility guidelines are prescribed annually by the secretary of agriculture for use in determining eligibility for free and reduced-price meals and for free milk.[23] These guidelines differ by the size of the family or economic unit and whether the student lives in Alaska or Hawaii. Eligibility for free meals is based on income at or below 130 percent of the federal poverty guidelines, while that for reduced-price meals is based on income between 130 and at or below 185 percent of the federal poverty guidelines. Each year the secretary of agriculture announces in the *Federal Register* the income eligibility guidelines to be used from July 1 of the year they are issued to June 30 of the following year.[24]

The panel considered two options for using the school-year guidelines with the calendar-year ACS data:

1. average the two guidelines from the 2 school years that occurred during the calendar year of the ACS data (e.g., average the guidelines for the 2009-2010 and 2010-2011 school years when using the 2010 ACS data), or
2. use the guidelines for the school year that began in the latter half of the calendar year of the ACS data (e.g., use the guidelines for school year 2010-2011 when using the 2010 ACS data).

After deliberating, the panel chose to use the second approach. The primary reason for this decision reflects the observation that most eligibility determinations for the school meals programs are made at the start of the school year, and the income for the "current" calendar year (which is not yet over) would be the best approximation of what the household would report. While a family can submit an application for

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[23]See http://www.fns.usda.gov/cnd/Governance/notices/iegs/IEGs.htm.
[24]See http://www.fns.usda.gov/cnd/Governance/notices/iegs/IEGs09-10.pdf.

the school meals programs any time during the year, the school district sends letters to households of all schoolchildren before the beginning of the school year, informing them of the school meals programs and inviting them to apply. A sample of the applications that have been received by October 1 of the school year must undergo verification. Data on enrollment and certification during October are the official data reported to NCES (as of October 1) and to FNS (as of October 31). Participants in the panel's workshop indicated that generally about 90 percent of applications are received by the end of October. Workshop participants further commented that possible reasons for later applications include downturns in the local economy that result in job losses, an influx of migrant workers, or attempts to obtain benefits for summer programs.

Definition of Income

In applying to receive benefits under the school meals programs, the "household must report current income on a free and reduced price application. Current income means income received by the household for the current month, the amount projected for the first month the application is made for or for the month prior to application. If this income is higher or lower than usual and does not fairly or accurately represent the household's actual circumstances, the household may, in conjunction with LEA [local education agency] officials, project its annual rate of income based on the guidelines on special situations" (U.S. Department of Agriculture/Food and Nutrition Service, 2011b:40). In the same document, FNS describes 14 categories that make up the income that should be reported.

The ACS collects data on the gross money income of household members aged 15 and older in the previous 12 months, so an economic unit's income can be compared against 130 **percent and 185 percent of the applicable** poverty guideline to determine its income eligibility status. These data are requested in eight detailed categories.

Appendix B further documents and contrasts these two detailed ways of collecting income. The FNS and ACS income definitions appear to be very close, both specifically mentioning most of the same sources of income. A few minor differences are discussed in the appendix.

While the ACS income data are designed to represent families' calendar-year income, they reflect income received over 2 calendar years. A household is asked to report the amount of income received by each person aged 15 or older in the last 12 months, with about one-twelfth of the sample being interviewed in each month of the calendar year. Consequently, a household interviewed in January 2010 would report income data for January 2009 through December 2009, while a household

interviewed in December 2010 would report income for December 2009 through November 2010. The Census Bureau adjusts each respondent's reported income using a Consumer Price Index (CPI) price adjustment to reflect differences in consumer prices between the 12-month period that was covered by the respondent's answers to the income questions and the calendar year of the interview.[25] Differences in the timing of income measurement between the ACS and applications for the school meals programs, combined with challenges in determining which school year should apply to a given public school student's record, contribute to specification error.

Another challenge in using the ACS data on benefit receipt and, more generally, income is reporting error. The ACS is no exception to the well-known phenomenon of underreporting of sources of income, including substantial underreporting of public assistance benefits by survey respondents (see Czajka and Denmead, 2008; Meyer and Sullivan, 2009). It has been hypothesized that income underreporting patterns on surveys are similar to those on applications for benefits.

Definition of Economic Unit

For the school meals programs:

Household composition for the purpose of making an eligibility determination for free and reduced priced benefits is based on economic units. An economic unit is a group of related or unrelated individuals who are not residents of an institution or boarding house but who are living as one economic unit, and who share housing and/or significant income and expenses of its members. Generally, individuals residing in the same house are an economic unit. However, more than one economic unit may reside together in the same house. Separate economic units in the same house are characterized by prorating expenses and economic independence from each other. (U.S. Department of Agriculture/Food and Nutrition Service, 2011b:37)

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[25]The following is the Census Bureau's description of its adjustments to income in the ACS: "Income components were reported for the 12 months preceding the interview month. Monthly Consumer Price Indices (CPI) factors were used to inflation-adjust these components to a reference calendar year (January through December). For example, a household interviewed in March 2010 reports their income for March 2009 through February 2010. Their income is adjusted to the 2010 reference calendar year by multiplying their reported income by the 2010 average annual CPI (January-December 2010) and then dividing by the average CPI for March 2009-February 2010." See http://www.census.gov/acs/www/Downloads/data_documentation/SubjectDefinitions/2010_ACSSubjectDefinitions.pdf.

An alternative and broader definition of an economic unit comes from FNS guidance to local school meals programs regarding the preparation of their application materials.[26] Item #11 of the generic *Letter to Households* says, "Who should I include as members of my household?" The answer is, "You must include all people living in your household, related or not (such as grandparents, other relatives, or friends). You must include yourself and all children living with you." Applicants are later instructed to list all household members, as well as each type of income for each member. This definition of an economic unit does not raise the possibility of multiple units living within the household and is consistent with the Census Bureau's definition of a household—all persons living in the same residence.[27]

The difference between the two FNS definitions of an economic unit led to considerable discussion among panel members. Should the panel attempt to evaluate eligibility based on an economic unit as defined by the *Eligibility Manual for School Meals* (U.S. Department of Agriculture/Food and Nutrition Service, 2011b), or should we use the definition embedded in the local instructions (i.e., a household)? We concluded that we should do our best to evaluate eligibility based on an economic unit.

For purposes of determining which persons in the household are sharing resources and which are economically independent of other household members, the only relevant information available from the ACS consists of the answer to the questions, "How many people are living or staying at this address?" and "How is each person related to person 1?" Possible responses for related individuals include husband or wife, biological son or daughter, adopted son or daughter, stepson or stepdaughter, brother or sister, father or mother, grandchild, parent-in-law, son-in-law or daughter-in law, and other relative. Possible responses for unrelated individuals include roomer or boarder, housemate or roommate, unmarried partner, foster child, and other nonrelative. The Census Bureau defines all related individuals as a "family" and all persons who live in the housing unit as a "household."[28]

The Healthy, Hunger-Free Kids Act of 2010 specifies that foster children are categorically eligible for free meals. The panel's definition of

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[26]See http://www.fns.usda.gov/cnd/frp/2010_application.doc.

[27]The *Eligibility Manual for School Meals* definition of an economic unit, cited above, is similar to the definition of a SNAP household in terms of focusing on the sharing of resources and expenses. See http://www.fns.usda.gov/snap/applicant_recipients/eligibility.htm.

[28]Not all federal agencies use these definitions. For example, according to the *Code of Federal Regulations for Agriculture*, 7 CFR 245.2:

245.2(b) Family means a group of related or nonrelated individuals, who are not residents of an institution or boarding house, but who are living as an economic unit; and 245.2(d) Household means family as defined in 245.2(b).

an economic unit removes foster children from a household for pur-
poses of determining the eligibility of other children who may live in the
household.[29]

While being related to the householder does not necessarily imply
a sharing of economic resources, the panel chose to make this inference,
so that all persons who were related to the householder (members of the
family) would be members of the same economic unit. We also chose to
include an individual reported as an "unmarried partner" as a member of
the economic unit containing family members. We believed that, although
not related by blood or marriage to the other members of the primary
family, an individual declared to be the householder's partner would be
sharing resources with the family. We denote the family plus unmarried
partner the "core family." The remaining question we addressed was
whether to assign unrelated individuals, particularly unrelated children,
to this economic unit or to other economic units within the household.

Although there is no perfect solution to the identification of eco-
nomic units given the data available in the ACS, the panel assessed the
sensitivity of eligibility estimates to alternative assignment strategies. As
discussed in detail in Appendix B, we prepared tabulations from the 2008
ACS Public Use Microdata Sample (PUMS) file. Five different methods
for arranging related and unrelated individuals into economic units in a
household were specified and compared at the national level, at the state
level, and for the 115 school districts that are coterminous with (that is,
occupy the entire same geographic territory as) one or more Public Use
Microdata Areas (PUMAs).[30] In preparing these tabulations, we removed
foster children from the household before determining eligibility for other
children. In all five methods, the "primary" economic unit included the
core family. Alternatives included different assignments for unrelated
individuals (other than the householder's partner) in a household: (1) all
are part of the primary economic unit (resulting in one unit per house-
hold); (2) each is a separate economic unit of size one (resulting in two
or more units per household); (3) all are in one secondary economic unit
(resulting in two units per household); and (4) all are part of the primary
economic unit if all unrelated individuals are children (resulting in one
unit per household), or all are in a separate economic unit if there is at
least one adult among the unrelated individuals (resulting in two units
per household).

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[29]Excluding foster children from a household when determining eligibility was consis-
tent with guidelines in place at the time the panel developed its specifications. Under U.S.
Department of Agriculture/Food and Nutrition Service (2011b) foster children are to be
counted as part of the household when determining eligibility for other household children.

[30]PUMAs were defined for the 2000 census by states in cooperation with the Census
Bureau to consist of one or more entire counties with at least 100,000 population; they will
be redefined after the 2010 census.

Of these, the panel opted for alternative 4. The primary economic unit consists of the core family. If the only unrelated individuals in a household are children, they are also assigned to the core family's economic unit. However, if the unrelated individuals in a household include one or more adults, they are collectively considered a second economic unit. The sensitivity analysis led us to conclude that any judgment about the choice of economic unit would likely have only a small impact on estimates of eligible children at the national level. As shown in Appendix B, while there could be more of an impact at the local level, it would still be small.

Categorical Eligibility

As discussed in Chapter 2, income eligibility is not the sole means by which individual students can obtain free school meals; participation in certain programs, for example, offers categorical eligibility for free meals. In the determinations discussed up to this point, eligibility is conferred solely on the basis of income. This section examines how categorical eligibility can increase the estimated percentages of school children who are eligible for free school meals.

Students are categorically eligible for free meals if someone in the family participates in certain means-tested public assistance programs targeting the low-income population. Specifically, students are categorically eligible for free meals if their families receive assistance from SNAP, TANF, or FDPIR. Foster children are also categorically eligible for free meals. Additionally, a student is categorically eligible if a family member is enrolled in a Head Start or Even Start Program (based on meeting that program's low-income criteria) or if the student is (1) a homeless child as determined by the school district's homeless liaison or by the director of a homeless shelter, (2) a migrant child as determined by the state or local Migrant Education Program coordinator, or (3) a runaway child who is receiving assistance from a program under the Runaway and Homeless Youth Act and is identified by the local educational liaison (U.S. Department of Agriculture/Food and Nutrition Service, 2011b). These definitions include both students who live in households and students who may not live in typical housing units (runaway, homeless, and some migrant children).

For persons in households, the ACS collects information about the receipt of SNAP benefits and the receipt of public assistance income. The receipt of SNAP benefits is reported on the household portion of the questionnaire. The respondent is asked to report that the household participates in SNAP if any person in that household received SNAP benefits during the past 12 months. Data on public assistance income are collected as item f in the income questions completed for each person in

the household aged 15 and older. Specifically, the respondent is asked to report "the amount of any public assistance or welfare payments from the state or local welfare office" received during the past 12 months. Although this amount may include payments from TANF, which confers categorical eligibility, it may also include payments from programs that do not confer categorical eligibility.[31]

While the ACS cannot be used to identify all sources of categorical eligibility, it can be used to identify those that affect the greatest number of children: SNAP and TANF. However, one challenge in using the ACS data on benefit receipt to measure categorical eligibility, discussed earlier, is reporting error (Czajka and Denmead, 2008:170). In the case of benefit receipt, a match between ACS and public records in Maryland showed that many ACS respondents do not report the SNAP or TANF benefits they actually receive.[32,33,34] There is also specification error because the time frames of the ACS SNAP and public assistance data (indicating participation at any time during the calendar year preceding the date of the ACS interview) do not match the time frame of the administrative data (indicating current participation) used to conduct direct certification or otherwise identify categorically eligible students in the school meals programs.

While one might expect that all categorically eligible students would also be income-eligible, there could be some categorically eligible students who are not estimated to be income-eligible based on the available ACS data. Reasons for this discrepancy could include not only measurement error in reporting income and program participation on the ACS, but also the fact that SNAP or welfare program participation may have

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[31]This potential shortcoming (inclusion in "public assistance" of state or local program benefits that do not confer categorical eligibility) is more than offset by the underreporting of TANF benefits. Meyer and colleagues (2009) show that in 2004, the most recent year for which they had data, administrative TANF dollar amounts exceeded ACS reports of receipt of public assistance by 15.6 percent of total TANF receipts.

[32]Two studies document results building on a match between ACS and SNAP records in Maryland. Taeuber and colleagues (2004) matched (weighted) 87,420 ACS records of households that reported receiving SNAP benefits in 2000-2001 to state benefit data but found an additional 50,939 ACS households that reported not receiving SNAP benefits when they were according to Maryland records. In an earlier study, Taeuber and colleagues (2003) found that the underreporting was greater for households without children than for households with children.

[33]Lynch and colleagues (2007) used a match of TANF records in Maryland to examine household characteristics related to underreporting. Of the 95 households in the match, 43 said "yes" to "public assistance" and 52 said "no." False-negative reporting accounts for 81 percent of the discrepancy. One reason for underreporting of TANF benefits for children is that "public assistance" is an income variable not reported for children under 15.

[34]A more recent match of 2001 ACS data with state-level administrative data for Maryland and Illinois found similar results (Meyer and George, 2011).

been gained on the basis of a period of low monthly income, while the 12-month income reported in the ACS was too high to meet the income eligibility criteria for the school meals programs. Additionally, broad-based categorical eligibility for SNAP (and hence free school meals) is conferred if a household qualifies for a noncash TANF or other benefit. A household (and hence students in a household) may qualify for noncash TANF benefits despite having income that exceeds the eligibility guide-lines for SNAP or the school meals programs.

The panel compared ACS estimates of eligibility using our preferred definition of an economic unit and considering the household to be a single economic unit in order to evaluate the contribution of receipt of SNAP benefits and public assistance income to the percentages of children eligible for free, reduced-price, and full-price school meals. This analysis, using the 2008 PUMS file, is described in Appendix B. The addition of categorical eligibility due to receipt of SNAP benefits increases the per-centage eligible for free meals by a little more than 5 percentage points for both definitions of an economic unit. Accounting for categorical eligibility because of receipt of both SNAP benefits and public assistance income increases the percentage eligible for free meals by nearly 6 percentage points for both economic unit definitions.[35]

Based on these results, the panel believes that SNAP and public assis-tance should be included in ACS tabulations of eligibility to account for categorical eligibility. These variables appear to identify students who are not eligible for free meals based on ACS income alone. The only caveat is that because of underreporting of SNAP benefits and public assistance income on the ACS and other household surveys, this approach likely does not capture all such categorically eligible students.

Group Quarters

In addition to people living in households, the ACS includes indi-viduals who live in group quarters. These individuals are surveyed as part of the ACS, but using a separate methodology. According to the Census Bureau:

> Group quarters are places where people live or stay, in a group living arrangement that is owned or managed by an entity or organization

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[35]Accounting for both SNAP and public assistance decreased the percentage eligible for reduced-price meals by about 2.5 percentage points for both economic unit definitions and the percentage eligible for full-price meals by about 3.5 percentage points. Accounting only for SNAP participation decreased the percentage eligible for reduced-price meals by 2.4 per-centage points and the percentage eligible for full-price meals by more than 2.6 percentage points under both economic unit definitions.

providing housing and/or services for the residents. These services may include custodial or medical care as well as other types of assistance, and residency is commonly restricted to those receiving these services. People living in group quarters usually are not related to each other. Group quarters include such places as college residence halls, residential treatment centers, skilled nursing facilities, group homes, military barracks, correctional facilities, workers' dormitories, and facilities for people experiencing homelessness. (U.S. Census Bureau, 2009:8-1)

The ACS has separate categories for institutional group quarters, such as correctional facilities and nursing homes, and for noninstitutional group quarters, such as college dormitories, military barracks, migrant worker camps, and shelters. Only a subset of the noninstitutional group quarters population might include children attending public schools.

The ACS survey of group quarters is based on independent state samples. For each state, a list of group quarters is constructed,[36] and a sample of included facilities is selected. An ACS interviewer collects data from a sample of residents at each sampled facility. The questions asked of group quarters residents include all the person-level questions of the ACS except household relationship and only the food stamp question from the housing unit questionnaire. Group quarters facilities were not included in the 2005 sample but have been included since 2006.

The Census Bureau provided the panel with useful information about the group quarters portion of the ACS, including the methods used for sample selection and estimation and the quality of the data at the state and substate levels. Because the group quarters survey is a state-based design, state-level estimates are of high quality. However, the quality of estimates at the substate level is highly variable, particularly by group quarters type. In part, this is because approximately half of all tracts listed with group quarters addresses in the Census Bureau's Master Address File sampling frame have had no sample units selected for 5 years. As a result, some areas and some types of group quarters are overrepresented in the sample, and some are underrepresented.

For purposes of this study, ACS data must provide estimates of eligibility for the school meals programs for small geographic areas defined by individual schools or school districts. All children attending these schools are eligible to obtain school meals for free or at the reduced or full price whether they live in traditional housing units or group quarters. Students

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[36]According to U.S. Census Bureau (2009:4-9), the ACS frame excludes domestic violence shelters, soup kitchens, regularly scheduled mobile food vans, targeted nonsheltered outdoor locations, crews of commercial maritime vessels, natural disaster shelters, and dangerous encampments for a variety of reasons, including concerns about privacy and confidentiality and the operational feasibility of repeat interviewing for a continuing survey.

attending public schools who live in group quarters (and are most likely migrant, runaway, or homeless youth) may be categorically eligible for free meals. Since the group quarters data are not reliable for small areas and since local school districts are likely to have good knowledge of students in their schools that come from group quarters, the panel concluded that group quarters students would be excluded from ACS tabulations. At our workshop, school district representatives indicated that they have information about the number of migrant, homeless, runaway, and other "group quarters" children in their jurisdictions. Our proposal, described in detail later in the report, allows districts to use local counts of categorically eligible children who do not live in traditional housing in computing final eligibility percentages and claiming percentages under the AEO.

Summary of Conclusions on How to Estimate Eligibility for Free and Reduced-Price School Meals

Based on the discussion presented above, the panel came to the following conclusions, which are reflected in the specifications provided to the Census Bureau in our request for tabulations (see Appendix D).

Conclusion 1: Providing a list of blocks associated with each grade in a school for the Census Bureau to use in constructing school attendance area estimates is an acceptable approach for tabulating ACS data for the school meals programs. School districts that plan to use this approach should evaluate blocks at the borders to ensure that large population groups are not assigned incorrectly.

Conclusion 2: An appropriate definition of a public school student in the ACS is a person aged 20 or younger with no high school diploma or GED who attended public school within the past 3 months and was in a grade included in the school or school district.[37]

Conclusion 3: The appropriate income eligibility guidelines to use with ACS data are those for the school year that began in the last half of the past calendar year referenced by the ACS data.

Conclusion 4: Because the ACS definition of income is sufficiently close to the definition of income for the school meals programs and the ACS measure of annual income is sufficiently close to other widely used measures of annual income, the ACS definition of income is

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[37]This definition does not use a lower limit on the age of a student. The definition allows students in pre-kindergarten programs and kindergarten if the school includes such students.

suitable for estimating income eligibility for the school meals programs. It should be noted, however, that the ACS income estimates for a calendar year reflect an average of incomes received in the past 12 months spanning a 2-year period. This income measure will not be as responsive to changes in economic conditions as will income measured in surveys for which the time frame covers a single calendar year, such as the CPS, and will also be less responsive than monthly income reported on applications for the school meals programs. Consequently, in areas where economic conditions are deteriorating (e.g., unemployment is rising), the ACS will likely understate the number of students eligible for free or reduced-price meals. Conversely, in periods of recovery, the ACS will likely overstate the number of students eligible for free or reduced-price meals.

Conclusion 5: Based on the analysis performed by the panel and our interpretation of the school meals programs' definition of an economic unit, an appropriate definition of an economic unit for determining eligibility for free or reduced-price school meals should allow for multiple economic units in an ACS household.

Conclusion 6: ACS data on the receipt of SNAP benefits and public assistance income should be used to account for categorical eligibility when deriving eligibility estimates for the school meals programs.

Conclusion 7: ACS group quarters data should not be used in estimating students eligible for free or reduced-price meals. Instead, districts should be allowed to adjust ACS eligibility estimates using valid local data on students who do not live in traditional housing.

Potential Limitations

This section summarizes some of the limitations associated with using geographic boundaries and the ACS variables to define the public school student population in total and the percentage that is eligible for free and reduced-price school meals.

Reasons for geography-related differences between actual enrollment in a school and residence in the school's catchment area include the following: (1) there may be students who attend the school but live outside the school catchment area, (2) there may be students who live within the school catchment area but do not attend the school, (3) school boundaries change over time, and (4) the boundaries used for tabulating ACS data might not reflect the latest changes. The first two issues are related to the presence and effects of charter schools, magnet schools, open enroll-

ment policies, and other school choice programs. Choice programs could result in an understatement of the percentage of students eligible for free or reduced-price meals if such programs tend to draw the more affluent students away from their neighborhood schools. Enrollment estimates could be similarly affected.

The collection of annual rather than monthly income in the ACS and the underreporting of SNAP benefits and public assistance income are likely to produce an underestimate of the percentage of students eligible for free meals when the ACS is used. As discussed below, this might necessitate some adjustment or benchmarking.

The impact of the exclusion of students who live in nontraditional housing from ACS estimates will likely contribute to underestimation of both enrollment and the number of students eligible for free meals. The impact would probably be small in most districts, but it could be large in some. To address this issue, the panel believes that local districts either have or can obtain valid data that could be used for an adjustment. All of these potential limitations of ACS estimates are addressed further in Chapters 4 and 5.

APPROACH TO EVALUATING ACS ESTIMATES

Estimates from probability survey samples such as the ACS are evaluated using a framework called "total survey error," which identifies the types of errors that occur at various points in the development of a survey estimate. Components of total survey error include sampling (reflecting the fact that data are collected on a portion, rather than all, of the population), coverage (the degree to which the frame used to draw the sample includes the entire target population), nonresponse (failure to obtain responses for the entire sample), specification (the degree to which a question asked matches the concept about which information is desired), measurement (unintentional or intentional errors in a respondent's answer), and processing (errors in applying coding, statistical processing, and estimation methods). In the context of estimating eligibility for free and reduced-price school meals, the most problematic error components for the ACS are likely to be sampling, specification, and measurement error. The ACS has relatively high coverage and response rates, and processing errors in an ongoing survey tend to be small because of the repeated use of systems developed for the survey. Also important to consider, as indicated in the previous section on limitations, are errors in the panel's specifications for using the ACS data to estimate eligibility for the school meals programs.

In March-April 2011, using the panel's specifications, the Census

Bureau provided us with ACS 5-year estimates for 2005-2009 for enrollment, percentage of students eligible for free meals, percentage of students eligible for reduced-price meals, and percentage of students eligible for full-price meals (and standard errors for each estimate) for all school districts in the country. The Bureau also provided 3-year estimates for districts with populations greater than 20,000 for the 2005-2007, 2006-2008, and 2007-2009 periods and 1-year estimates for the largest districts—those with populations greater than 65,000—for each year from 2005 to 2009. In addition, the Census Bureau provided five 1-year model-based ACS estimates for the percentage of students eligible for free meals and the percentage eligible for reduced-price meals for each year from 2005 to 2009. It also provided one set of ACS direct 5-year estimates and five sets of 1-year model-based ACS estimates for all schools with boundaries in our five case study districts.

This section describes the panel's approach to evaluating the quality of the ACS-based estimates of eligibility through a comparison with estimates from other data sources. Results of the comparison are presented in Chapter 4. In particular, ACS direct and ACS model-based estimates for school districts were compared with administrative estimates from the CCD, which, while not error-free, is the most complete and readily usable alternative source of data for school districts and schools available to the panel. ACS direct and model-based estimates were also compared with each other to help us determine which might be best to use in the AEO. Finally, estimates from the FNS-742 administrative data were compared with the CCD administrative estimates to help in assessing any differences between these two benchmarks that might illuminate our comparisons. At the school level, the ACS 5-year and model-based estimates were compared with estimates from administrative data provided by the case study districts. School-level data provided by the districts were also compared with CCD school-level data.

A number of questions needed to be answered through this evaluation.

- Are ACS direct and model-based estimates for school districts consistent with administrative estimates from the CCD? Are ACS estimates for schools consistent with administrative estimates provided by the case study school districts and administrative estimates from the CCD? These comparisons would identify whether there are systematic differences between estimates from the survey and administrative data sources.
- How variable are the ACS estimates? We assessed precision, as measured by the variance, standard error (SE), or coefficient of

variation (CV),[38] as well as variation over time. Variation over time will be important for school districts considering a new provision because such variation causes changes in reimbursement from year to year, some of which are desirable and some of which are not from a district's perspective. Finally, what is the trade-off between temporal stability and responsiveness to real changes in socioeconomic conditions?

- Is the difference between ACS estimates and CCD estimates related to district characteristics? Among the characteristics we considered were size of district (measured by enrollment) and prevalence of students certified for free or reduced-price meals (measured by FRPL category).

Our analyses needed to address another issue—the relationships among three distributions: (1) the distribution of students eligible or certified in a district by category (free, reduced price, full price); (2) the distribution of meals served in a district by category under traditional operating procedures when some students pay (based on their certification status) the reduced price or full price for a meal; and (3) the distribution of meals that a district would expect to serve by category under the AEO when meals are provided free to all students. Understanding these relationships is critical for developing claiming percentages that reflect not only the distribution of eligible students but also the rates at which they participate, that is, take meals when the meals are free for everyone. Under standard economic assumptions, we expect those participation rates (under the AEO) to be higher than the rates under traditional operating procedures, which will affect the distribution of meals served. It is appropriate that this participation effect of the AEO be captured in the percentages used to claim reimbursement under the AEO. Analyzing such claiming percentages, the projected reimbursements implied by

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[38]Accuracy is assessed by comparing an estimator to a true value. The theoretical bias of an estimator is defined as its mean (its average or expected value over repeated sampling) minus the true value. An estimator is said to be "unbiased" if its bias is zero. It is approximately unbiased if it is on average "close" to the true value; for example, "close" might mean that the (absolute value of the) bias is less than 5 percent of the truth. An accurate estimator is at least approximately unbiased. An estimator is said to be precise if its expected variation in repeated sampling is small. The theoretical variance measures expected variation as the average squared deviation of the estimator from its mean. The standard error of an estimator is the square root of its variance, and is expressed in the same units as the measurements and, thus, the mean. The CV expresses the variation in a way that does not depend on the unit of measurement. It is the ratio of the SE to the mean. The mean squared error (MSE) is measured as the average squared deviation of the estimator from the true value. It is equal to the sum of the variance and the squared bias. The root mean squared error (RMSE) is the square root of the MSE. It is in the same units as the measurements.

those percentages, and the ACS eligibility estimates, a school district will be able to assess the financial viability of adopting the AEO.

The key parameters of interest for our analysis include the percentage of enrolled students eligible for free meals, the percentage eligible for reduced-price meals, and the sum of the two: the percentage eligible for either free or reduced-price meals. In addition, the panel focuses on the BRR as a summary measure of the distribution of students (or meals served) across the free, reduced-price, and full-price categories. The BRR is the average reimbursement per meal under the assumption that reimbursement is based on eligibility, certification, or meals served percentages, and is calculated as a weighted sum of the percentages for the free, reduced-price, and full-price categories. The weights in the sum are the per meal reimbursement rates paid by the federal government. We used the rates that were in effect during 2008-2009 in a district eligible for the $.02 per meal increment: $2.59, $2.19, and $.26 for free, reduced-price, and full-price meals, respectively. (Constant reimbursement values were used so that comparisons over time would not be affected by inflation.)

As described above, the panel classified districts based on two main characteristics: (1) percentage of students eligible for free or reduced-price meals and (2) size (small, medium, or large). The free or reduced-price percentage is directly related to a district's potential interest in the AEO. The so-called "very high FRPL" districts had at least one free or reduced-price percentage equal to or greater than 75 percent over a span of several school years (2004-2005 through 2009-2010) and might consider district-wide adoption of the AEO. During those same school years, the so-called "high FRPL" districts had free or reduced-price percentages of 50 percent in at least one year but never as high as 75 percent and might consider the AEO, but perhaps only for a subset of schools. Districts with free or reduced-price percentages of less than 50 percent in every year are unlikely to benefit from the AEO.

Two aspects of district size are important to the panel. The definitions of small, medium, and large presented above are related to the ACS direct estimates that would be available to a district. Population size is important as well because it is related to sample size and hence sampling error (larger samples are associated with smaller sampling error). In our analyses, we also used a related measure of size—enrollment. As noted previously, Table 3-1 shows the population of school districts categorized according to free and reduced-price percentage and district population size. As discussed above, we had available five 1-year ACS estimates for the large school districts, three 3-year estimates for the medium districts, and only one 5-year estimate for the small districts. Table 3-3 illustrates the theoretical sampling error associated with different enrollment categories and different free or reduced-price percentages.

TABLE 3-3 Illustrative Approximate Standard Errors of ACS Direct Estimates by Type of ACS Release, School Enrollment, and Estimated Fraction of Free and Reduced-Price Eligible Students

| ACS Release | School Enrollment | Fraction of Students Eligible for Free or Reduced-Price Meals | | | | |
		0.5	0.6	0.7	0.8	0.9
1-year	12,000	0.091	0.090	0.084	**0.073**	**0.055**
1-year	16,000	0.079	0.077	0.072	**0.063**	**0.047**
1-year	20,000	0.071	0.069	**0.065**	**0.057**	**0.042**
3-year	4,000	0.089	0.088	0.082	**0.071**	**0.054**
3-year	7,000	0.068	0.066	**0.062**	**0.054**	**0.041**
3-year	10,000	0.057	**0.055**	**0.052**	**0.045**	**0.034**
5-year	500	0.191	0.187	0.175	0.153	0.115
5-year	1,500	0.110	0.108	0.101	0.088	**0.066**
5-year	3,000	0.078	0.076	0.071	**0.062**	**0.047**

NOTE: For purposes of this report, we calculated standard errors using the formula for a simple random sample and a design effect of 3. Data provided by the Census Bureau include the actual standard errors of all estimates. The standard error divided by the estimate and converted to a percentage gives the coefficient of variation (CV), which should be 10 percent or less by commonly used statistical standards; a higher CV indicates a less reliable estimate. In this table, the standard errors in boldface type are 10 percent or less of the estimated fraction of students eligible for free or reduced-price meals.
SOURCE: Prepared by the panel.

Systematic Differences

To address the question of consistency between estimates from the ACS and alternative administrative data sources, the panel evaluated the difference between an ACS estimate (enrollment, percentage free, percentage reduced price, percentage free or reduced price, BRR) and the corresponding estimate from an alternative data source computed for each school district or school in our evaluation database.[39] If the average of these differences over a large group of districts (or schools) were near zero, we would conclude that there is no systematic difference between the two estimates. We analyzed systematic differences by examining the average difference over districts or schools grouped by variables that we think may have a relationship to such differences: FRPL level and size. We also analyzed potential sources of differences using additional data, including SNAP administrative data and data from the Survey of Income and Program Participation (SIPP). In addition, we considered whether a

[39]The panel's evaluation data base is named prog9_merged_fns_wSE.xlsx.

regression model could be used to adjust for differences between ACS and CCD estimates based on demographic and other variables that were available from the CCD.

Precision, Intertemporal Stability, and Timeliness

To evaluate precision, intertemporal stability, and timeliness, the panel concentrated on the BRR because it is stability of reimbursement that is of greatest importance to school food authority directors. For ACS estimates (direct and model-based), the primary measure of precision is the sampling error, as measured by the standard error.[40] Because they are based on a larger sample, the 5-year ACS estimates for a district will have smaller sampling error than the 3-year or 1-year estimates. However, this greater precision comes at a price: a 5-year ACS estimate reflects the average observed over a 5-year period, and thus will be relatively slow in adjusting to real changes in the economy. Trade-offs between stability and timeliness are assessed by comparing the year-to-year variability in BRRs computed using CCD certification data versus the alternative ACS eligibility estimates (1-, 3-, and 5-year). The BRRs based on CCD certification percentages provide an indication of the year-to-year variation in reimbursement that is normally experienced by and, therefore, will likely be acceptable to districts. Data on school district reimbursements under the school meals programs were not available to the panel, so there is no way to compare ACS estimates with actual reimbursement data.

Participation

For the case study districts and schools within those districts, the panel compared BRRs based entirely on distributions of students with BRRs based on distributions of meals served. These distributions and the associated BRRs differ because students in the different categories participate at different rates, with, generally, students receiving free meals having the highest rate, students paying full price having the lowest rate, and students paying a reduced price having a rate between the other two. The BRRs based on the distribution of meals served reflect these differential participation rates, whereas the BRRs based entirely on the distribution of eligible or certified students take no account of participation. Comparing the BRRs illustrates how a district would generally be underreimbursed if participation were not taken into account in developing claiming percentages.

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[40]Standard errors were provided by the Census Bureau for all ACS direct and model-based estimates.

Taking participation into account, however, is complicated because participation rates will likely increase in each category—probably by different amounts—if a district adopts the AEO and provides free meals to all students in some or all of its schools. As noted above, given standard economic assumptions about the role of prices in demand for school meals (that school meals are a normal good, for which demand increases when the price decreases), adoption of the AEO would be expected to increase demand among all students who were not already approved to receive free meals. The availability of free school meals for all students might also be expected to increase demand (increase the number of school meals consumed) among those eligible for free meals because it would reduce the family's burden of applying for benefits and remove any perceived stigma associated with participating in the program. Because the panel had limited data with which to assess the impact of increases in participation attributable to providing free meals, we simulated the potential effects of the AEO on participation and examined how the simulated participation effects would affect BRRs. In light of our results, our proposed procedure for implementing the AEO includes the operation of a base year during which all students receive free meals, applications are solicited from parents, and certification and verification are conducted. With this approach, as under Provision 2, the increases in participation can be estimated and reflected in claiming percentages. The claiming percentages will also incorporate eligibility estimates based on the most recently released ACS data.

Assessment of the Need for Benchmarking

The panel's central goal was to assess the suitability of ACS estimates to support the school meals programs from the perspective of the estimates' fitness for use. We found that the conceptual fit of the ACS estimates is acceptable, although it would benefit from additional research. Chapter 4 presents our analysis of any systematic differences between ACS and administrative estimates and considers the precision, temporal stability, and timeliness of ACS estimates. If there are districts in which ACS eligibility estimates fluctuate excessively in ways that are not consistent with real changes in socioeconomic conditions, there will be little a district can do other than decide not to adopt the AEO. If ACS estimates are fairly stable but differ systematically from administrative estimates, however, a procedure for benchmarking the ACS estimates to the administrative estimates could provide the best way to use ACS data in support of the school meals programs. Based on the results of our analyses (presented in Chapter 4 and in several appendixes), we developed procedures for implementing the AEO, presented in Chapter 5.

4

Data Analysis and Results

To determine the suitability of the American Community Survey (ACS) as a source of claiming percentages for reimbursement under an ACS Eligibility Option (AEO) for universal free school meals, the panel implemented the technical approach described in Chapter 3 and conducted extensive analyses of the ACS direct and model-based estimates produced by the U.S. Census Bureau. This chapter describes the principal results of these analyses and presents the panel's main conclusions. Additional results from our analyses are reported in Appendix F.[1]

The chapter begins with an analysis of the differences between ACS and administrative estimates, including consideration of the many reasons why such differences might arise. The potential sources of differences include errors in each set of estimates. ACS estimates are subject not only to sampling error but also to nonsampling error from, for example, households not responding at all to the survey or responding incorrectly by misreporting their incomes or whether they received benefits from the Supplemental Nutrition Assistance Program (SNAP, formerly the Food Stamp Program). Although not subject to sampling error, administrative estimates reflect the effects of certification error, as discussed in Chapter 2, as well as data entry, tabulation, and transmission error. Some differences between the estimates are undoubtedly attributable to the use of survey

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[1]To simplify an already complex set of analyses, the panel focused on school lunches. For a district considering actual implementation of the AEO, it will be important to consider breakfasts separately from lunches, given the different reimbursement rates for the two programs.

versus administrative procedures, while others arise because the procedures are intended to obtain different data. For example, the ACS collects data on income received in the past 12 months on a rolling basis. Thus households interviewed in January report on income received during the period from the previous January through December, while households interviewed in December report on income received during the period from the previous December through November. In contrast, school meals program applications obtain data on current monthly income, which will typically be income for the month in which the application is being completed or the previous month—probably July, August, or September for most students. Even if the data obtained by the ACS and by program applications are fully accurate, eligibility based on annual income can be different from eligibility and certification based on monthly income. Yet another difference is that the ACS records where students live, while school meals program certification data are based on where students attend school. In areas with school choice options, such as charter and magnet schools or open enrollment policies, some students may not attend their neighborhood school or even any school in the district in which they reside. This phenomenon will be captured in the administrative data but not the ACS data.

The second section of the chapter presents the panel's analysis of the precision, intertemporal stability, and timeliness, as well as the general relative performance, of the alternative estimates from the ACS, including the 1-year, 3-year, 5-year, and model-based estimates. As discussed in Chapter 3, stability in reimbursement is important to districts because it facilitates budgeting and other planning activities involved in operating the school meals programs. Nonetheless, some instability in reimbursement occurs naturally under traditional operating procedures as a result of changes in certification percentages and participation rates from year to year due to ups and downs in the economy, outreach efforts by school authorities, and other factors. However, basing reimbursements on ACS estimates will introduce additional instability due to sampling variability and other sources of error that cause estimates to fluctuate. Because they are based on larger samples and average the data collected in different years, 5-year ACS estimates will tend to be more precise and stable than 3-year estimates, which will be more precise and stable than 1-year estimates. However, the precision and stability carry a cost: the 5-year estimates and, to a lesser degree, the 3-year estimates will be less timely and less responsive to real changes in socioeconomic conditions. The panel's analyses explored these trade-offs.

The panel also explored the role of participation—that is, the purchase or free receipt of meals by students. Participation is important because it is the basis for reimbursing districts for the meals they serve

under traditional operating procedures or Provisions 2 and 3. The ACS, however, does not collect data on participation. It provides estimates of eligibility, specifically the numbers and percentages of students eligible for free, reduced-price, and full-price meals. Unless students in the three eligibility categories participate at the same rate, which, generally, they do not, the distributions across the categories of students and of meals served will not be the same and may differ substantially. Thus claiming percentages based entirely on the percentages of eligible students in each category will differ from claiming percentages based on the percentages of meals served in each category. In fact, with students eligible for free and reduced-price meals participating at higher rates than students paying full price, claiming percentages based solely on ACS estimates of eligible students—with no accounting for differences in participation—could cause districts to be substantially under reimbursed should they adopt the AEO. This effect could be at least partially mitigated, however, by the changes in participation that might occur under the AEO with free meals being offered to all students, substantially lowering the monetary cost of meals for those students formerly paying full price and increasing their participation rates relative to other students. In the third section of the chapter, the panel analyzes the role of participation and the potential effect of offering free meals to all students under the AEO. In Chapter 5, we propose an approach to implementing the AEO that incorporates into the AEO claiming percentages not only the ACS eligibility estimates but also the participation rates of students when all are offered free meals.

DIFFERENCES BETWEEN ACS AND ADMINISTRATIVE ESTIMATES

The panel compared ACS estimates of students eligible for school meals by category (free, reduced price, full price) with administrative data on students certified for each category. The administrative data are from the Common Core of Data (CCD) for most of our analyses at the district level. School districts report data for the CCD to state agencies, which submit the data to the National Center for Education Statistics. For our school-level analyses, the case study districts provided the administrative data directly to us at our request. As described in Chapter 3, the administrative data are subject to error; thus, they are not a gold standard. However, they were the best standard available to us. Although we generally characterize average differences between ACS and administrative estimates as measures of systematic error in the ACS estimates, the limitations of the administrative data should be kept in mind. Later in this chapter, we explore the potential effects of certification error in the

administrative estimates on the differences between ACS and administrative estimates.

The analyses presented in this chapter focus on those districts for which the AEO is most relevant: the districts described as "very high FRPL [free or reduced-price lunch]" and "high FRPL" in Chapter 3. A very high FRPL district had at least 75 percent of its students eligible for free or reduced-price meals according to the CCD in one or more school years from 2004-2005 to 2009-2010. Although a high FRPL district never reached that threshold, it did have at least 50 percent of its students eligible for free or reduced-price meals during one or more of those years. For some of our analyses of these districts, we present separate results for large, medium, and small districts. The large districts have populations of at least 65,000, and thus have 1-year ACS estimates as well 3- and 5-year estimates. The medium districts have populations of 20,000 to 65,000 and have 3- and 5-year but not 1-year ACS estimates. The remaining districts, with populations under 20,000, have only 5-year ACS estimates and are designated as small. Although all districts included in our analyses have model-based estimates, we focus in this section on the 1-, 3-, and 5-year direct estimates from the ACS.

Systematic Differences Between ACS and Administrative Estimates

The panel's analyses revealed that ACS estimates differ systematically from administrative estimates for districts that might be most interested in the AEO. Figure 4-1 plots ACS and CCD estimates of the percentage of students eligible for free meals in very high FRPL districts. The ACS estimates are 5-year estimates for 2005-2009, and the CCD estimates are for school year (SY) 2009-2010. Because the purpose of using ACS data is to provide current estimates, we compare the most recent ACS estimates with the most recent estimates from the CCD. Thus, the ACS 5-year estimates for 2005-2009 are compared with the CDD estimates for SY 2009-2010.[2] Some of the observed average difference between these two sets of estimates maybe attributable solely to their different reference periods and the fact that the economy was worsening, resulting in an upward trend in the percentage of students eligible for free or reduced-price meals. From 2005 to 2009 according to the CCD, the percentage of students eligible for free or reduced-price meals in very high FRPL districts rose from 76.3 percent to 79.7 percent. For high FRPL and all districts,

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[2]We follow the same principle with 3-year estimates, comparing the estimates for 2005-2007, 2006-2008, and 2007-2009 with CCD estimates for school years 2007-2008, 2008-2009, and 2009-2010, respectively.
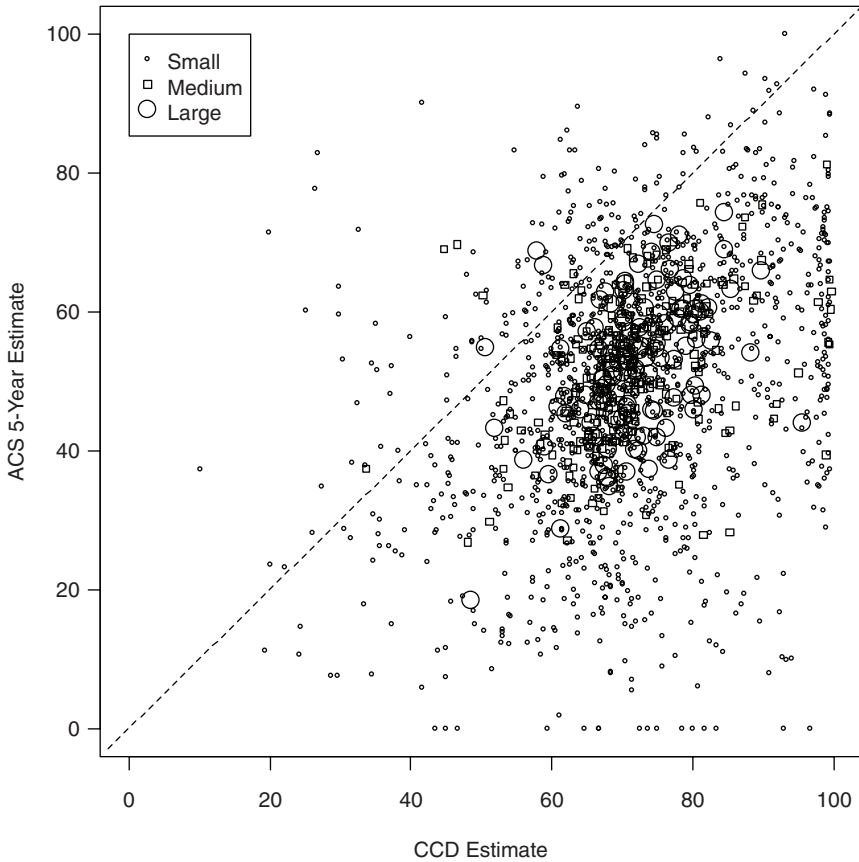
FIGURE 4-1 Comparison of ACS 5-year (2005-2009) and CCD (2009-2010) estimates for very high FRPL districts: Percentage of students eligible for free meals.
NOTE: ACS = American Community Survey; CCD = Common Core of Data; FRPL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

this percentage increased from 52.9 percent to 59.8 percent and from 43.2 percent to 47.5 percent, respectively.[3,4]

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[3]For very high FRPL districts, the percentages of students eligible for free or reduced-price meals were 76.3, 75.4, 75.3, 77.6, and 79.7 for 2005, 2006, 2007, 2008, and 2009, respectively, according to the CCD. For the high FRPL districts, the corresponding percentages were 52.9, 53.1, 54.2, 56.3, and 59.8, and for all districts, they were 43.2, 43.3, 43.8, 45.3, and 47.5.

[4]Although the use of older data is a potentially serious limitation of the 5-year estimates relative to the 1-year and even the 3-year estimates, we also compared the 5-year ACS estimates with 5-year averages of CCD estimates to assess their differences when they include,

In Figure 4-1, the overwhelming majority of districts fall below the 45° line of equality between the estimates, indicating that the ACS identifies a smaller percentage of students as eligible for free meals relative to the CCD. For many of these very high FRPL districts, the percentage of students eligible for free meals according to the ACS is substantially lower than the percentage based on the administrative data on certified students.

In contrast, a different pattern pertains to the estimates of students eligible for reduced-price meals. According to Figure 4-2,[5] the ACS estimate exceeds the CCD estimate for a majority of districts, but the difference often is just a few percentage points. Many districts are clustered around the line of equality between the ACS and administrative estimates for the reduced-price category.

The scatter plots in Figures 4-1 and 4-2 suggest that for the typical very high FRPL district, the ACS substantially underestimates the percentage eligible for free meals and slightly overestimates the percentage eligible for reduced-price meals. The net effect of these patterns is that on average, the ACS estimate is substantially less than the CCD estimate for the percentage of students eligible for free or reduced-price meals and for the blended reimbursement rate (BRR) based on eligible students, as shown in Figures 4-3 and 4-4, respectively.

Tables 4-1, 4-2, 4-3, and 4-4 provide numerical estimates of the average differences between ACS and CCD eligibility percentages and BRRs.[6] The first column in the top panel of Table 4-1 pertains to 5-year estimates for all very high FRPL districts and corresponds to the results presented

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in principle, the same trend within the reference period of the estimates. The results of that comparison are qualitatively the same as the results of our comparisons of 5-year ACS estimates with 1-year CCD estimates. Although statistically significant for all types of estimates and large for percentage free, percentage free or reduced price, and BRR, the differences, of course, are smaller than those from our main comparisons because the differences based on CCD 5-year averages ignore the loss of timeliness due to the use of older data by the ACS 5-year estimates. Further details can be found in Appendix F, which also presents a comparison of 3-year ACS estimates with 3-year averages of CCD estimates.

[5]In this figure, the 5-year ACS estimates have a relatively large number of sampling zeros because the percentage eligible for reduced-price meals is relatively small, and some districts are small areas. One possible reason for zeros in the CCD data is that missing data are recorded as zeros.

[6]For reasons given above, Tables 4-1, 4-2, and 4-4 compare the ACS 5- and 3-year estimates with the CCD estimates for the most recent school year in the reference period of the ACS estimates. Accordingly, the ACS 5-year estimates for 2005-2009 and 3-year estimates for 2007-2009, for example, are compared with the CCD estimates for SY 2009-2010. Appendix F presents tables that compare the ACS 5- and 3-year estimates with 5- and 3-year averages of CCD estimates for the same time periods. Such comparisons reflect differences when data are aligned in time but do not reflect the loss of timeliness that would result from using the multiyear estimates in the AEO.
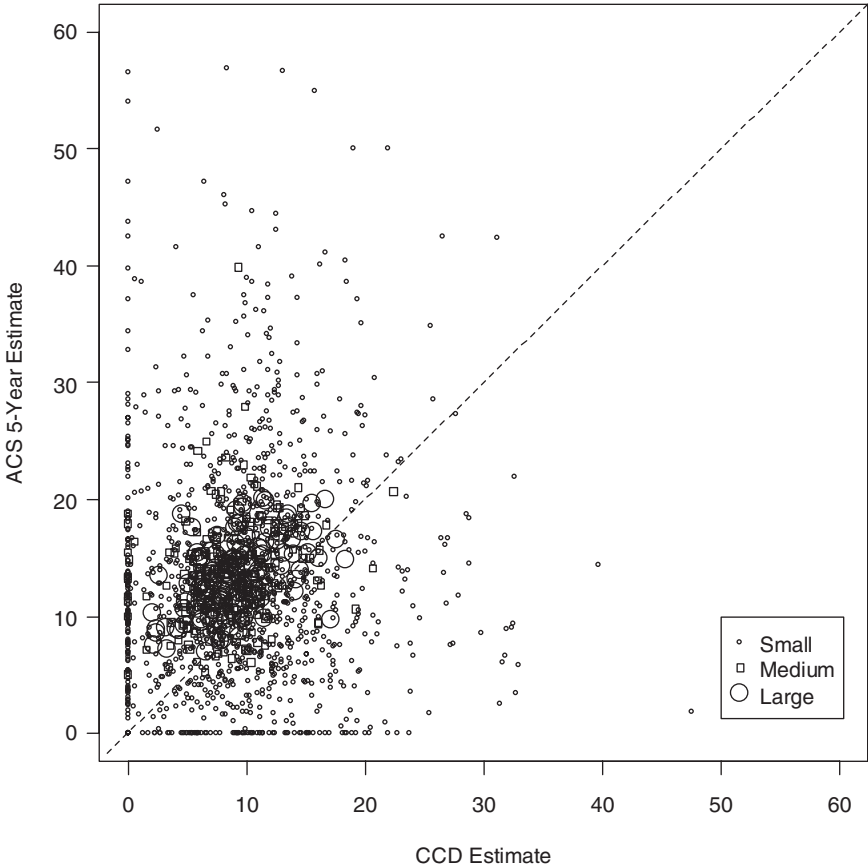
FIGURE 4-2 Comparison of ACS 5-year (2005-2009) and CCD (2009-2010) estimates for very high FRPL districts: Percentage of students eligible for reduced-price meals.
NOTES: This figure excludes two outliers. Both are small districts. One has a CCD estimate of 2 percent and an ACS estimate of 78 percent, and the other has a CCD estimate of 80 percent and an ACS estimate of 6 percent. ACS = American Community Survey; CCD = Common Core of Data; FRPL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

in Figures 4-1 through 4-4. The last three columns in the top panel of Table 4-1 provide separate estimates for large, medium, and small districts, and the bottom panel provides estimates of average ACS-CCD differences for high FRPL districts. Tables 4-2 and 4-3 display average ACS-CCD differences for 3-year and 1-year ACS estimates, respectively. Table 4-2 includes
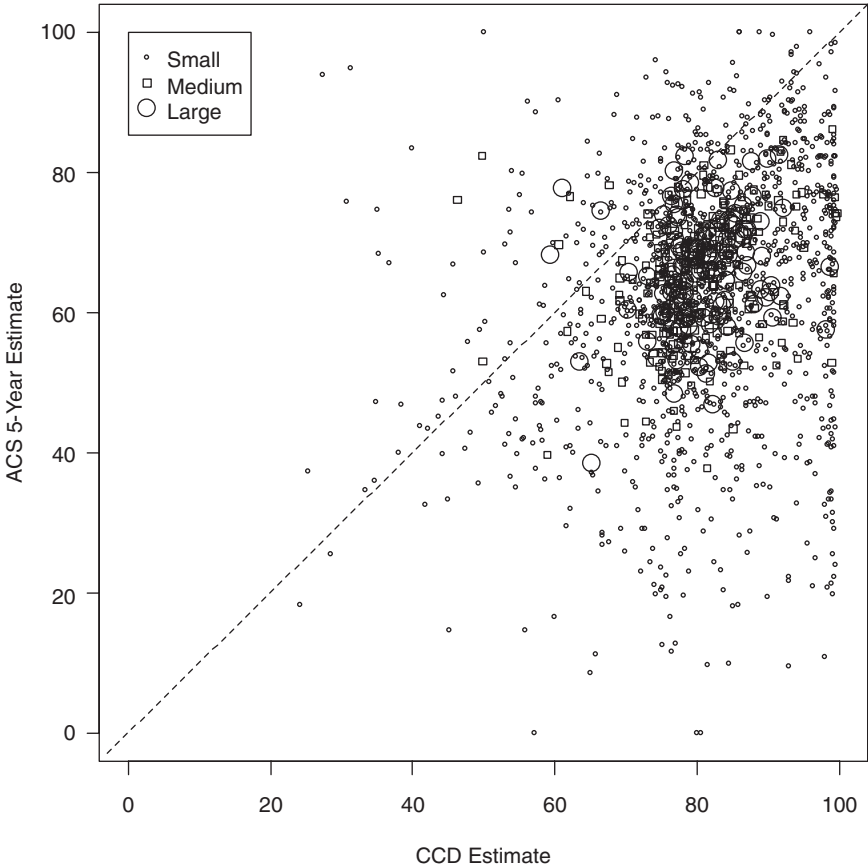
FIGURE 4-3 Comparison of ACS 5-year (2005-2009) and CCD (2009-2010) estimates for very high FRPL districts: Percentage of students eligible for free or reduced-price meals.
NOTE: ACS = American Community Survey; CCD = Common Core of Data; FRPL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

only large and medium districts because small districts do not have 3-year ACS estimates. Similarly, Table 4-3 includes only large districts because they are the only districts with 1-year ACS estimates. Table 4-2 provides results for each of the three available sets of 3-year estimates (2005-2007, 2006-2008, and 2007-2009), and Table 4-3 provides results for each of the five available sets of 1-year estimates. All differences in each of these
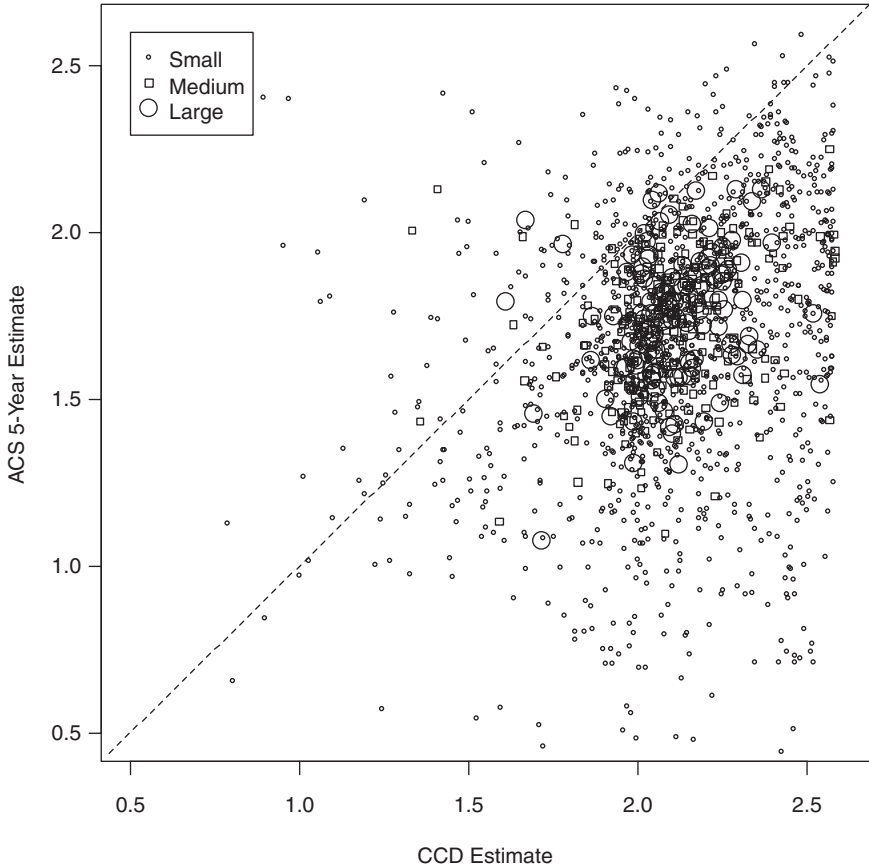
FIGURE 4-4 Comparison of ACS 5-year (2005-2009) and CCD (2009-2010) estimates for very high FRPL districts: BRR.
NOTES: This figure excludes three outliers, all of which are small districts with ACS BRRs of $0.26. Their CCD BRRs are $1.50, $2.10, and $2.10. ACS = American Community Survey; BRR = blended reimbursement rate; CCD = Common Core of Data; FRPL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

tables are statistically significant, that is, significantly different from zero.[7] Table 4-4 summarizes the results in the other tables by averaging across the three sets of 3-year estimates and the five sets of 1-year estimates.

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[7]Statistical significance is determined by comparing the ratio of the average difference to its estimated standard error with critical values from a standard normal distribution.

TABLE 4-1 Average Differences Between ACS 5-Year Estimates for 2005-2009 and CCD Estimates for 2009-2010

Estimand	All Districts	Large Districts	Medium Districts	Small Districts
Very High FRPL Districts	(1,641)	(122)	(227)	(1,292)
Percentage free	–21.7	–19.5	–20.4	–22.2
Percentage reduced price	4.0	4.5	5.0	3.8
Percentage free or reduced price	–17.8	–15.0	–15.4	–18.4
BRR, $	–0.43	–0.37	–0.38	–0.44
High FRPL Districts	(4,214)	(304)	(710)	(3,200)
Percentage free	–10.8	–13.6	–12.1	–10.3
Percentage reduced price	2.3	2.7	2.8	2.1
Percentage free or reduced price	–8.5	–11.0	–9.3	–8.1
BRR, $	–0.21	–0.27	–0.23	–0.20

NOTES: All average differences are statistically significant (different from zero) at the 0.01 level. ACS = American Community Survey; BRR = blended reimbursement rate; CCD = Common Core of Data; FRPL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

For very high FRPL districts, several consistent patterns emerge from these tables of average ACS-CCD differences:

- The average ACS estimate of the percentage of students eligible for free meals is typically 15 to 22 percentage points lower than the average CCD estimate.
- The average ACS estimate of the percentage of students eligible for reduced-price meals is typically about 3 to 4 percentage points higher than the average CCD estimate.
- The ACS's overestimation of the percentage eligible for reduced-price meals is not sufficient to compensate for the underestimation of the percentage eligible for free meals. Thus, the average ACS estimate of the percentage eligible for either free or reduced-price meals is typically 12 to 18 percentage points lower than the average CCD estimate.
- For a BRR based on the distribution of students across categories, the average ACS estimate is usually about $0.30 to $0.40 lower than the average CCD estimate of roughly $2.10.

Qualitatively similar patterns are observed for average high FRPL districts: overestimation of the percentage reduced-price-eligible, but underestimation of the percentage free-eligible, the percentage free or reduced-price-eligible, and the BRR. Also, all of the differences are statis-

TABLE 4-2 Average Differences Between ACS 3-Year Estimates and CCD Estimates for Last School Year in ACS Reference Period

Estimand	Large and Medium Districts			Large Districts			Medium Districts		
	2005-2007	2006-2008	2007-2009	2005-2007	2006-2008	2007-2009	2005-2007	2006-2008	2007-2009
Very High FRPL Districts	(337)	(350)	(349)	(121)	(123)	(122)	(216)	(227)	(227)
Percentage free	-17.1	-18.6	-20.1	-15.5	-18.2	-19.5	-17.9	-18.8	-20.4
Percentage reduced price	3.6	3.1	3.9	3.7	2.9	3.7	3.5	3.2	4.1
Percentage free or reduced price	-13.5	-15.5	-16.2	-11.8	-15.3	-15.7	-14.5	-15.6	-16.4
BRR, $	-0.33	-0.37	-0.39	-0.29	-0.37	-0.38	-0.35	-0.38	-0.40
High FRPL Districts	(972)	(1,012)	(1,014)	(298)	(303)	(304)	(674)	(709)	(710)
Percentage free	-8.4	-10.2	-12.7	-9.8	-11.2	-13.6	-7.8	-9.8	-12.3
Percentage reduced price	1.9	1.7	2.3	1.9	1.7	2.2	1.9	1.7	2.3
Percentage free or reduced price	-6.5	-8.5	-10.5	-7.9	-9.5	-11.4	-5.9	-8.1	-10.1
BRR, $	-0.16	-0.21	-0.25	-0.19	-0.23	-0.27	-0.15	-0.20	-0.24

NOTES: All average differences are statistically significant (different from zero) at the 0.01 level. ACS = American Community Survey; BRR = blended reimbursement rate; CCD = Common Core of Data; FRPL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

TABLE 4-3 Average Differences Between ACS 1-Year Estimates and CCD Estimates, Large Districts Only

Estimand	2005	2006	2007	2008	2009
Very High FRPL Districts	(123)	(126)	(121)	(123)	(122)
Percentage free	–15.1	–15.1	–17.4	–19.0	–17.2
Percentage reduced price	3.6	2.9	3.1	2.1	2.9
Percentage free or reduced price	–11.5	–12.2	–14.3	–16.9	–14.3
BRR, $	–0.28	–0.30	–0.34	–0.40	–0.34
High FRPL Districts	(297)	(306)	(298)	(303)	(304)
Percentage free	–8.8	–8.9	–11.4	–11.2	–11.5
Percentage reduced price	1.9	1.4	1.6	1.0	1.5
Percentage free or reduced price	–6.9	–7.4	–9.7	–10.1	–10.0
BRR, $	–0.17	–0.18	–0.23	–0.24	–0.24

NOTES: All differences are statistically significant (different from zero) at the 0.01 level. ACS = American Community Survey; BRR = blended reimbursement rate; CCD = Common Core of Data; FRPL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

TABLE 4-4 Average Across Years of Average Differences Between ACS Estimates and CCD Estimates for Very High FRPL and High FRPL Districts

Estimand	5-Year Estimates for All Districts	3-Year Estimates for All Medium and Large Districts	1-Year Estimates for All Large Districts
Very High FRPL Districts	(1,641)	(329)	(113)
Percentage free	–21.7	–18.9	–17.1
Percentage reduced price	4.0	3.5	2.9
Percentage free or reduced price	–17.8	–15.4	–14.2
BRR, $	–0.43	–0.37	–0.34
High FRPL Districts	(4,214)	(962)	(280)
Percentage free	–10.8	–10.6	–10.5
Percentage reduced price	2.3	1.9	1.4
Percentage free or reduced price	–8.5	–8.6	–9.1
BRR, $	–0.21	–0.21	–0.22

NOTE: ACS = American Community Survey; CCD = Common Core of Data; FRPL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

TABLE 4-5 Average Across Years of Average Differences Between ACS Estimates and CCD Estimates for Low to Moderate FRPL Districts

Estimand	5-Year Estimates for All Districts	3-Year Estimates for All Medium and Large Districts	1-Year Estimates for All Large Districts
Low to Moderate FRPL	(5,255)	(973)	(263)
Percentage free	–4.7	–5.0	–4.9
Percentage reduced price	2.3	1.3	1.0
Percentage free or reduced price	–2.4	–3.7	–3.9
BRR, $	–0.06	–0.09	–0.09

NOTE: ACS = American Community Survey; BRR = blended reimbursement rate; CCD = Common Core of Data; FRPL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

tically significant. The magnitudes of the average ACS-CCD differences, however, are much smaller for the high FRPL districts than for the very high FRPL districts. For the high FRPL districts, average BRR differences are typically $0.15 to $0.25, rather than the $0.30 to $0.40 for the very high FRPL districts. Furthermore, as shown in Table 4-5 and in more detailed tables in Appendix F, average BRR differences are even smaller—$0.05 to $0.13—for low and moderate FRPL districts, that is, districts with FRPL percentages below 50 percent in all school years from 2004-2005 through 2009-2010.[8] These results demonstrate a challenge entailed in using ACS data to obtain school meals program eligibility estimates with which to implement the AEO. Specifically, the differences between ACS and administrative estimates are greatest, on average, for those districts for which the AEO might otherwise be most attractive (because they have higher fractions of students certified for free or reduced-price meals under traditional operating procedures).[9]

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[8] It is notable that the differences between ACS and administrative estimates for these districts, which make up the majority of districts in the country, are not very large. The average ACS estimate of the percentage of students eligible for free or reduced-price meals is typically only 1 to 5 percentage points less than the average CCD estimate.

[9] Average differences between ACS and CCD estimates of district enrollment are presented in Appendix F. For very high FRPL districts, average ACS estimates of enrollment are 7 to 12 percent higher than average CCD estimates for large districts and 2 to 4 percent higher for medium and small districts. For high FRPL districts, average ACS estimates tend to be roughly equal to or slightly lower than average CCD estimates.

Potentially Important Sources of Systematic Differences

The results just presented demonstrate that ACS eligibility estimates are different from estimates derived from administrative data on student enrollment and certification for free and reduced-price school meals. Because ACS estimates are based on samples of households, sampling error will cause them to differ from CCD estimates for individual districts. However, sampling error cannot account for the large differences between estimates from the ACS and CCD that have been derived by averaging across many districts because sampling error is purely random and "averages out" to approximately zero. In fact, we find that the differences are statistically significant, that is, greater than would be expected as a result of sampling error alone. In contrast, errors in the estimates based on certification data and, in particular, the aggregate over certification found in the Access, Participation, Eligibility, and Certification (APEC) study (described in Chapter 2) may contribute to the observed average differences between ACS and CCD estimates. The results of the panel's analysis of the potential effects of certification error are presented below.

Errors in the ACS estimates can also contribute to the differences between those estimates and administrative estimates. The panel's review of the literature, consultation with experts during our meetings and workshop, and analyses revealed four major potential sources of systematic error in ACS estimates that may contribute to the average differences between the ACS and CCD estimates:

- underreporting of SNAP participation in the ACS;
- determination of eligibility from annual income in the ACS rather than monthly income as in the application process for the school meals programs;
- limitations of using ACS data to count homeless students, students in families of migrant or seasonal workers, and other students who do not live in traditional housing; and
- the effects of families' exercising school choice opportunities, such as attending charter, magnet, and other nonneighborhood schools.

Other sources of systematic error in ACS eligibility estimates include underreporting of Temporary Assistance for Needy Families (TANF) participation, incorrect identification of economic units within ACS households, the inability to derive eligibility estimates not just based on monthly income but for the specific months for which incomes are reported on applications (mainly July, August, and September) and for school attendance as of October (the month to which certification estimates pertain) to capture important seasonal effects, and inadequate

imputation or other adjustments for nonresponse to the entire ACS survey or to specific income and program benefit questions.[10] Below we discuss the potential contribution of administrative certification error to the differences between ACS and CCD estimates, and then the four sources of error in ACS estimates listed above.

Certification Error in Administrative Estimates

As described in Chapter 2, the APEC study (U.S. Department of Agriculture/Food and Nutrition Service, 2007b) provided national estimates for SY 2005-2006 of the percentages of students who were misclassified by eligibility category. The APEC certification error estimates apply to all certified students (including those directly certified) and denied applicants, that is, applicants who were denied free or reduced-price certification. These error rates do not apply to students who were not directly certified and whose families did not apply for benefits. Although it is likely that most of these students were not eligible for free or reduced-price meals, some may have been, and there is no current information about the true eligibility distribution of nonapplicants. Accordingly, the panel considered a range of assumptions pertaining to nonapplicants, two of which are presented here to support examination of the potential impact of certification error on the differences between ACS eligibility estimates and administrative certification estimates.

The panel used the APEC certification error estimates (reproduced in Table G-7 in Appendix G) to evaluate the potential impact of certification error on administrative eligibility estimates; detailed results are presented in Appendix G. Table 4-6 shows results for three hypothetical districts. Each is assumed to have 10 percent of its students certified for reduced-price meals. The percentages certified for free meals are 65 percent, 75 percent, and 85 percent to illustrate the effects of certification error on administrative estimates for districts with very high levels of free or reduced-price students. Two different eligibility distributions are displayed in Table 4-6 based on different assumptions concerning those who do not apply for benefits. For the first distribution (denoted "(1)" in Table 4-6), we assumed that among those students who must pay full price because they were not approved for free or reduced-price meals, 10 percent applied for but were denied free or reduced-price certification. The remaining 90 percent did not apply, and we assumed that all of these nonapplicants were truly eligible only for full-price meals. For the 10 percent who applied but were denied free or reduced-price certi-

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[10]Analyses conducted by the panel and described in Appendix G indicate that imputation for nonresponse makes a negligible contribution to the ACS-CCD differences.

TABLE 4-6 Potential Effects of Certification Errors on the Distribution of Students Under Various Assumptions

	Certified Students	Eligible Students (1)	Eligible Students (2)	Eligible (1)-Certified (percentage points or $)	Eligible (2)-Certified (percentage points or $)
Hypothetical District 1—75% of Students Certified for Free or Reduced-Price Meals					
Free	65%	60%	62%	–5	–3
Reduced price	10%	10%	12%	0	2
Full price	25%	30%	26%	5	1
Free or reduced price	75%	70%	74%	–5	–1
BRR	$1.97	$1.84	$1.94	–$0.13 (–6%)	–$0.03 (–1%)
Hypothetical District 2—85% of Students Certified for Free or Reduced-Price Meals					
Free	75%	68%	70%	–7	–5
Reduced price	10%	10%	12%	0	2
Full price	15%	21%	19%	6	4
Free or reduced price	85%	79%	81%	–6	–4
BRR	$2.20	$2.05	$2.11	–$0.15 (–7%)	–$0.09 (–4%)
Hypothetical District 3—95% of Students Certified for Free or Reduced-Price Meals					
Free	85%	77%	77%	–8	–8
Reduced price	10%	11%	11%	1	1
Full price	5%	12%	11%	7	6
Free or reduced price	95%	88%	89%	–7	–6
BRR	$2.43	$2.26	$2.28	–$0.18 (–7%)	–$0.16 (–6%)

NOTES: To derive the estimates of eligible students denoted "(1)," we assumed that among those students who must pay full price because they were not approved for free or reduced-price meals, 10 percent applied for but were denied free or reduced-price certification. The remaining 90 percent did not apply, and we assumed that all of these nonapplicants were truly eligible only for full-price meals. For the 10 percent who applied but were denied free or reduced-price certification, we assumed that the true eligibility distribution conformed to the Access, Participation, Eligibility, and Certification Study (APEC) estimates: 19.0, 16.6, and 64.4 percent were eligible for free, reduced-price, and full-price meals, respectively. To derive the estimates of eligible students denoted "(2)," we assumed that among those students who must pay full price because they were not approved for free or reduced-price meals, 25 percent applied for but were denied free or reduced-price certification. For these applicants, we assumed that the true eligibility distribution conformed to the APEC estimates. For the 75 percent who were nonapplicants, we assumed that 9.5, 8.3, and 82.2 percent were eligible for free, reduced-price, and full-price meals, respectively. These percentages for free and reduced-price eligibility are equal to half of the APEC estimates. BRR = blended reimbursement rate.
SOURCE: Prepared by the panel.

fication, we assumed that the true eligibility distribution conformed to the APEC estimates for denied applicants: 19 percent, 16.6 percent, and 64.4 percent were eligible for free, reduced-price, and full-price meals, respectively. Although results of the APEC study suggest that the national application rate for students who must pay full price is on the order of 10 percent or a little higher, this rate may be higher in districts with very high percentages certified for free or reduced-price meals because applying for benefits is more common in those districts. Therefore, to derive the estimates of eligible students denoted "(2)" in Table 4-6, we assumed that among those students who must pay full price because they were not approved for free or reduced-price meals, 25 percent applied for but were denied free or reduced-price certification. For these applicants, we assumed that the true eligibility distribution conformed to the APEC estimates. For the 75 percent who were nonapplicants, we assumed that the true eligibility distribution was 9.5 percent, 8.3 percent, and 82.2 percent eligible for free, reduced-price, and full-price meals, respectively. These percentages for free and reduced-price eligibility are equal to half of the APEC estimates pertaining to denied applicants. These assumptions and the others we considered (see Appendix G) are intended to illustrate the impact of certification errors under a range of possibilities.

Under the first set of assumptions, Table 4-6 shows that across the three hypothetical districts, certification error causes the percentage of students eligible for free or reduced-price meals to be overestimated by 5 to 7 percentage points and the BRR to be overestimated by $0.13 to $0.18 (6 to 7 percent)—that is, the administrative certification estimates of these values are too large. Under the second set of assumptions, however, the effects of certification error are smaller and vary more widely. For the district with 95 percent of its students certified for free or reduced-price meals, certification error causes the BRR to be overestimated by $0.16 (6 percent)—nearly as much as under the first set of assumptions. For the district with 85 percent of its students certified for free or reduced-price meals, however, the BRR is overestimated by $0.09 (4 percent), while it is overestimated by just $.03 (1 percent) in the district with 75 percent of its students certified for free or reduced-price meals. These results suggest that the estimated effects of certification error become more sensitive to our assumptions about nonapplicants as the percentage of students certified for free or reduced-price meals becomes smaller.

What do the illustrative results in Table 4-6 suggest about the potential effects of certification error on the differences between ACS eligibility estimates and administrative certification estimates? For very high FRPL districts, we found that BRRs based on ACS eligibility estimates are, on average, about $0.30 to $0.40 less than BRRs based on certification estimates from the CCD. If our first set of assumptions about nonapplicants is

accurate, certification error may account for about one-third to three-fifths of the average differences between ACS and CCD estimates. If our second set of assumptions about nonapplicants is more accurate, however, certification error may account for about one-half of the difference between ACS and CCD estimates in some districts, but perhaps for only one-tenth of the difference in other districts.

Our analysis suggests that certification error probably contributes to the observed differences between ACS and administrative estimates. However, we had to rely on assumptions to conduct our analysis, and the results are not definitive. The effects of certification error may be fairly small or very large. One also must keep in mind that the APEC estimates are national estimates pertaining to all districts—not just districts with high percentages certified for free or reduced-price meals—and are several years old. Changes in recent years in, for example, the percentage of students who are directly certified may have changed certification error rates. To obtain more current estimates, the Food and Nutrition Service (FNS) recently initiated a second APEC study.

Underreporting of SNAP Participation in the ACS

A large body of research literature has documented substantial underreporting in household surveys of benefits from programs such as SNAP. Czajka and Denmead (2008:170) summarize the literature, noting that "as a rule surveys underreport numbers of participants in means tested programs. . . ."

To evaluate underreporting of SNAP benefits in the ACS and its potential impact on school meals eligibility estimates, the panel compared the estimated number of individuals aged 5-17 in households reporting SNAP benefits on the ACS with the estimated number of individuals aged 5-17 receiving SNAP benefits according to the SNAP Quality Control (SNAP QC) file for the same period. The latter is an administrative data set containing detailed demographic, economic, and SNAP eligibility and benefit information for an annual sample of more than 45,000 SNAP households that is representative at the state level. Additional detail on the SNAP QC data and our analysis can be found in Appendix G.

Our analysis revealed that for the country as a whole, the ACS underestimates the number of individuals aged 5-17 in households receiving SNAP benefits by a statistically significant 4.4 percent. Our analysis also suggests, however, that the magnitude of underreporting likely varies across states and, therefore, probably across school districts. Relative to SNAP QC estimates, we found large, statistically significant underestimates by the ACS for California (–15 percent), Delaware (–33 percent), New Mexico (–25 percent), and Tennessee (–15 percent). In contrast, we

found relatively small, statistically insignificant differences—including some overestimates—for several states, such as Arizona (0.6 percent), Arkansas (1.7 percent), the District of Columbia (–0.7 percent), Indiana (1.9 percent), Minnesota (0.5 percent), and Wisconsin (–1.8 percent). Because SNAP eligibility and benefit rules are the same nationwide, differential underreporting of SNAP benefits must be at least partially attributable to SNAP households with differing characteristics having different propensities to report their participation in the program. Areas with more households having a higher propensity not to report participation will then have higher rates of underreporting. Therefore, the observed variation in underreporting across states suggests that a simple, uniform correction probably would not be effective in eliminating most of the difference between the ACS and CCD estimates for most districts. Furthermore, even if accurate state-level corrections could be applied, it appears unlikely that they would substantially eliminate ACS-CCD differences for all or most school districts because such corrections would not address variations in underreporting across districts within a state associated, for example, with variation among districts in the characteristics of households and reporting propensities. Finally, a correction for SNAP underreporting will substantially reduce the average difference between BRRs estimated from the ACS and administrative data only if it moves large numbers of students from the full-price category to the free or reduced-price category. According to the SNAP QC data, however, fewer than 0.1 percent of individuals aged 5 to 17 in SNAP households live in a household with gross income that exceeds 185 percent of the poverty line.[11]

Eligibility Determined from Annual Rather Than Monthly Income

The ACS collects data on annual income and annual receipt of program benefits. However, eligibility for the school meals programs is based on current monthly income and current participation. Moreover, once a student has been certified as eligible for free or reduced-price school meals, that student is eligible for the rest of the school year and for the first month of the next, even if the student's family income increased beyond the eligibility limits.

The panel used 2004 Survey of Income and Program Participation

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[11]Although correcting for underreporting would shift students from the reduced-price category to the free category, this would have a relatively small effect on the BRR. For example, a seemingly large adjustment that raises the percentage free-eligible from 60 percent to 70 percent while lowering the percentage reduced-price-eligible from 15 percent to 5 percent increases the BRR by only about $0.04.

(SIPP) data to compare eligibility estimates based on monthly income with those based on annual income. Detail on the SIPP data, the preparation of the data files, and the analysis are presented in Appendix G. SIPP is the only source of nationally representative monthly income data based on following the same people over time. The SIPP monthly income data were collected in 4-month waves, that is, through interviews conducted every 4 months. This interviewing schedule may obtain smoother, that is, less variable income data than would be obtained with monthly interviews if respondents, for example, tend to report 4-month averages or provide the most recent monthly amount for all 4 months. Although the panel is not aware of evidence that this occurs, it is a potential limitation of the SIPP monthly income data for our analysis and could cause the differences between eligibility estimates based on monthly and annual income to be understated.

As discussed in further detail in Appendix G, the Census Bureau implemented several enhancements in the 2004 SIPP panel, including dependent interviewing, to improve the accuracy of income reporting. With the collection of earnings data being tied specifically to spells of employment, a change in income—attributable, for example, to the loss of a job—that is sufficiently large to affect eligibility status for the school meals programs is likely to be captured in the SIPP even if the timing of the change is not exactly correct because of "seam bias." (Seam bias occurs when changes are more likely to be reported between rather than within waves.) Thus, we expect that our analysis of SIPP data provides a reasonably accurate basis for assessing the effect of using annual rather than monthly income to determine eligibility for the school meals programs, although the effect could be understated if there is still a propensity among SIPP respondents to misreport the timing of changes in income.

Table 4-7 shows selected results of this analysis. The first data column provides the BRR based on monthly income, and the second provides the BRR based on annual income. Both sets of estimates take into account categorical eligibility for free meals due to SNAP or TANF participation. The differences between BRRs due to computing eligibility based on annual instead of monthly income are shown in the third column. The average difference over all students is –$0.14. The last data column gives the ratio of the BRR based on annual income to the BRR based on monthly income. Results are shown for several groups of students defined by education of householder, metropolitan versus nonmetropolitan area, and census region.

Across groups defined by education of householder, which is likely to be a proxy for socioeconomic status, the difference in the BRR ranges from –$.09 to –$0.16 (but not monotonically), and the ratio of the BRR based on annual income to the BRR based on monthly income decreases

TABLE 4-7 BRRs Based on Monthly and Annual Income Estimates: Bias and Ratio

Group	Monthly BRR ($)	Annual BRR ($)	Bias (Annual/ Monthly) ($)	Ratio Annual/ Monthly
All Students	1.23	1.09	–0.14	0.89
Education of Householder				
No high school degree	2.11	2.02	–0.09	0.96
High school graduate	1.49	1.35	–0.14	0.91
Some college	1.18	1.02	–0.16	0.86
College graduate	0.72	0.58	–0.14	0.80
Metro vs. Nonmetro Area				
Metro	1.20	1.06	–0.14	0.89
Nonmetro	1.36	1.20	–0.16	0.88
Census Region				
New England	0.98	0.86	–0.12	0.88
Middle Atlantic	1.17	1.05	–0.12	0.90
East North Central	1.18	1.05	–0.13	0.89
West North Central	1.06	0.93	–0.14	0.87
South Atlantic	1.24	1.09	–0.15	0.88
East South Central	1.46	1.35	–0.11	0.92
West South Central	1.43	1.27	–0.16	0.89
Mountain	1.21	1.07	–0.14	0.88

NOTE: BRR = blended reimbursement rate.
SOURCE: Prepared by the panel using the 2004 Survey of Income and Program Participation.

monotonically from 0.96 for households in which the householder has no college degree to 0.80 for households with a college-educated householder.[12] Across census regions, the difference due to using annual rather than monthly income varies from –$0.11 to $0.16.

Although using annual rather than monthly income surely contributes to the ACS's underestimation of BRRs, it probably does not explain all of the average differences observed between ACS and administrative estimates. In Table 4-7, students in households in which the householder does not have a high school degree have, at 81 percent, the highest percentage eligible for free or reduced-price meals. By that measure, this group most resembles a district that might be interested in adopting the AEO. How-

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[12]The percentage of students eligible for free meals is highest at 69 percent for households in which the householder has no high school degree and drops markedly to 15 percent as the education of the householder increases to college graduate.

ever, the underestimation of the BRR due to using annual income for that group is relatively small at –$0.09 (4 percent) compared with the average ACS-CCD difference of –$0.30 to –$0.40 documented above. Moreover, it appears unlikely that a simple, uniform adjustment of estimates based on annual income would substantially reduce ACS-CCD differences for school districts because, as suggested by the results in Table 4-7, the effect of using annual rather than monthly income will likely vary as socio-economic conditions and the composition of households vary across districts. Even if the true effect is somewhat larger than we estimated because of the reporting issues described above, it still would not account for all—or nearly all—of the observed average difference between ACS estimates and administrative data. Furthermore, any misreporting of monthly changes in income probably varies across households of different types and thus across districts with different populations, strengthening our conclusion that a simple global correction, especially one based on SIPP data, would be of limited effectiveness.

Limitations of Using ACS Data to Count Students Who Do Not Live in Traditional Housing

Some of the differences observed between ACS and administrative estimates may be attributable to the challenges that arise in counting homeless students, students living in migrant labor camps, and other students who do not live in traditional housing and are categorically eligible for free meals. Although most of these students would be represented in the ACS group quarters data, such estimates are reliable at the state level, not at finer levels of geographic detail, such as school catchment areas or school districts (see Appendix G).[13] Thus, the panel chose to have data for the group quarters population excluded from the estimates we requested from the Census Bureau and to obtain instead estimates that pertain only to the household population. If large enough numbers of students are thereby excluded, the ACS estimates will understate enrollment and the percentage eligible for free meals.[14]

In operating the school meals programs, school districts receive, where relevant, lists of homeless students from the homeless liaison and lists of migrant students from the Migrant Education Program. Such students then are certified as eligible for free meals. If there were a non-negligible number of migrant students, for example, in a district that wanted to implement the AEO and if the Migrant Education Program

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[13]The reason pertains to the group quarters sample design in the ACS (see National Research Council, 2012).

[14]The percentages eligible for reduced-price and full-price meals will be overstated.

could specify how many migrant students lived in migrant labor camps and how many in traditional housing, a simple adjustment to the ACS estimates based on the household population could be used to include the students living in migrant labor camps among those estimated as being eligible for free meals.[15] ACS estimates could be similarly adjusted based on a list of homeless students.[16]

The effect on ACS estimates of excluding students living in migrant labor camps and homeless and other such students likely varies widely among districts, and the panel is not aware of the availability of data on counts of migrant or homeless students for all school districts in the nation. We had data on migrant students from two of our case study districts. In Omaha, the average number of migrant students was about 200, just over 1 percent of the students eligible for free meals. In Pajaro Valley, the number of migrant students was 7,125 (63 percent of students eligible for free meals) in 2005-2006, but declined to 1,618 (15 percent) in 2009-2010. Most of these migrant students likely lived in traditional housing, but some may not have. According to data provided to the panel by the Shenandoah Valley (Virginia) Migrant Program, 17 of its 135 migrant students (12.6 percent) lived in labor camps last school year. In general, although the data available to us for analyzing the issue of students living in nontraditional housing were limited, school districts will know if they have substantial numbers of migrant and homeless students and can obtain official counts from the appropriate liaisons. Such counts could be used to adjust ACS estimates of eligible students on a district-by-district basis rather than as a component of a statistical program producing eligibility estimates for all districts in the country, and this is our recommended approach in Chapter 5.

Migrant children typically are present in a school district for only a portion of a year. In Pajaro Valley, for example, migrant students are present only from May to October. Those who live in traditional housing units will be represented in the ACS in proportion to the time they spend in the district—about 50 percent in Pajaro Valley. However, the October certification numbers from the district will include all migrant students, contributing to the large observed undercount of students eligible for free

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[15]Assume that the district establishes that k categorically eligible children do not live in traditional housing units and the total enrollment is E. If the ACS estimate for percentage free-eligible is pf and for percentage reduced-price-eligible is pr, then the estimate for the total number of students eligible for free meals is $pf * (E - k) + k$, the estimated number of students eligible for reduced-price meals is $pr * (E - k)$, and the estimated number eligible for full-price meals is $(1 - pf - pr) * (E - k)$.

[16]Such adjustments could cause students to be double counted if they lived in traditional housing some of the time and were included in the population estimates used to weight the ACS data.

or reduced-price meals by the ACS relative to the data from the district. Mobility of students, if related to eligibility for school meals, will contribute to systematic differences between ACS and administrative estimates.

Effects of Families' Exercising School Choice Opportunities

To use the ACS to derive school meals program eligibility estimates, one must assign students to schools and districts based on the addresses of their homes. While such an approach is valid for most students, it may introduce error when students have options to attend not only their neighborhood schools but also other public schools. Private school attendance is not a concern because the ACS data distinguish between public and private school students. Among public school students, however, students may choose to attend charter, magnet, or open enrollment schools instead of their neighborhood schools at different rates based on income, with, for example, students from more affluent families exercising such options more frequently than students from less affluent families. This will affect not only the ACS eligibility estimates for some neighborhood schools but also the estimates for an entire district if, for example, the local charter schools are not part of the district.

For purposes of assessing the effects of public school choice on the AEO, it is important to distinguish between intra- and interdistrict choice. Many districts may find the AEO appealing at the district level, in which case intradistrict choice plans will have no effect. Whether students who are eligible for free or reduced-price meals are disproportionately drawn to schools of choice, such as open enrollment, magnet, or district charter schools, will not affect the overall percentage of these students in the district. As a result, school choice will not pose a problem for ACS eligibility estimates. However, if students leave the district, for example, to attend an independent charter school or are part of another interdistrict choice plan, and if students eligible for free or reduced-price meals differentially choose these options, ACS estimates will misrepresent the percentage of students eligible for free or reduced-price meals attending district schools. A similar issue arises if a district is interested in adopting the AEO in only some schools within the district. In this case, both intra- and interdistrict choice are potentially problematic, as the ACS estimates of the percentage of eligible children in any school based on residence may misrepresent actual attendance.

The available data with which to address this issue of school choice are limited. However, the panel obtained and analyzed data for two districts in very different situations: the District of Columbia Public Schools (DCPS) and the Omaha Public Schools. DCPS had 140 public schools in 2008-2009, while 60 independent public charter schools drew students

from the same area. Thirty-six percent of all public school students who resided in the District of Columbia attended a charter school that was not part of DCPS. Thus, DCPS offers an opportunity to examine the potential effects of interdistrict choice on ACS estimates. Available administrative data from DCPS indicate that assigning all public school students to their catchment area schools based on residence understates the free and reduced-price meals eligibility percentage by about 6.5 percentage points relative to the percentage based on actual enrollment. Thus, in addition to sampling and other errors associated with estimating catchment area eligibility percentages, we estimate that the ACS could underestimate the districtwide free and reduced-price eligibility percentage by as much as 6.5 percentage points as a result of public school choice. Moreover, school choice could introduce potentially meaningful errors at the school level. Fully 31 percent of the DCPS schools would be misclassified relative to the 75 percent free or reduced-price meals eligibility level we identified as a possible threshold for adoption of the AEO. Because such a large share of public school students residing in the District of Columbia attend schools outside the DCPS system, DCPS likely is indicative of a relatively large impact of school choice, although not necessarily an upper bound on that impact.

Omaha Public Schools, one of the panel's case study districts, is an open enrollment district. The district provided us with data for school year 2008-2009 on the number of students enrolled in each school versus the number who lived in the school's catchment area, as well as data on the number of students eligible for free or reduced-price meals by enrollment versus catchment area residence. We used these data to make several comparisons: (1) administrative estimates based on actual school enrollment versus administrative estimates based on catchment area enrollment, that is, the enrollment that would have occurred if all students attended their catchment area schools (errors in the latter are attributable to failure to take open enrollment into account); (2) administrative estimates based on catchment area enrollment versus ACS estimates (errors in the latter are associated with sampling and other ACS errors); and (3) administrative estimates based on actual enrollment versus ACS estimates (errors in the latter reflect ACS sampling and other errors, as well as errors due to the inability to take open enrollment into account). We summarize these comparisons by noting the differential categorization of schools as having less than or at least 75 percent of their students eligible for free or reduced-price meals.

If catchment area rather than actual enrollments are used, 15.6 percent of schools are misclassified. When we compare ACS estimates with administrative estimates based on catchment area enrollment, 11 percent of schools fall below the 75 percent threshold according to the ACS when

in fact they are above the threshold according to the administrative estimates, while 4 percent of schools are above the threshold according to the ACS but below according to the administrative data. Accounting for open enrollment misclassification as well as other errors by comparing ACS estimates with administrative estimates based on actual enrollment, we find that the ACS misclassifies 22.7 percent of schools—16 percent are incorrectly classified as below the threshold and 6.7 percent as above the threshold.

More generally, as reported in detail in Appendix G, the panel's analyses suggest that school choice is not sufficiently pervasive to cause concern regarding use of the ACS to estimate free or reduced-price eligibility in most public schools and school districts. In an important subset of schools and districts, however, attendance at noncatchment area schools occurs frequently enough that these districts should carefully consider whether this condition could contribute to large differences between estimates based on residence, such as those from the ACS, and estimates based on actual enrollment. At the district level, this could occur when a substantial portion of students have exercised the ability to choose schools that are not part of the district, such as charter schools in independent districts. At the school level, this could occur when a relatively large percentage of students have chosen to attend noncatchment area schools.

Use of a Statistical Model to Adjust for Differences Between ACS and Administrative Estimates

The panel's analyses suggest that there are at least several potentially important sources of differences between ACS and administrative estimates, and the contributions of these sources are likely to vary substantially among districts. The effects of school choice and of students living in nontraditional housing, for example, will tend to be highly localized and variable, with many districts having no effects at all and others having moderate to large effects. Thus, a simple, uniform adjustment that increases each district's BRR, for example, by a given additive or multiplicative quantity appears unlikely to be an effective approach for largely eliminating the contribution of one of these sources of ACS-administrative differences. Moreover, even if an adjustment for one source were effective, at least several other adjustments would still be necessary.

An alternative approach would be to develop a predictive statistical model that related the observed ACS-CCD difference for a district to the characteristics of that district as measured in the CCD and other district-level data sources with national coverage. To distinguish systematic relationships from the effects of sampling variability, this model would be estimated from data for a large collection of districts, such as

all districts in the country or all high and very high FRPL districts. After the model had been estimated, a predicted ACS-CCD difference would be derived from the model for each district and used to adjust the district's ACS estimate. For example, $0.35 would be added to a district's BRR if the model predicted, based on the district's characteristics, that the ACS would underestimate the district's BRR by $0.35.[17]

Although time and resources did not permit a thorough assessment of the potential effectiveness of using a predictive model to adjust for ACS-CCD differences, the panel was able to conduct some exploratory analyses. For these analyses, we used data for all very high FRPL districts to estimate a model that related differences between ACS 5-year BRR estimates and CCD BRR estimates to a rich set of predictors from the CCD. This set included the state in which the district was located, the district's total enrollment, several predictors reflecting the district's composition by the race and ethnicity of enrolled students, several predictors measuring the rate at which the district's students attend nonneighborhood schools within the district, and several predictors measuring the district's proximity to charter schools that are not part of the district.

When specifying the set of potential predictors, an issue that arises concerns the use of predictors based on the free and reduced-price meals certification data contained in the CCD. Should such predictors be included in the model? Although they might contribute substantially to the model's predictive ability, administrative data on these predictors would not be available for a district after it adopted the AEO. Thus, the predictors could not be used to derive an adjustment for ACS estimates on an ongoing basis.[18] As discussed in Chapter 5, however, an adjustment could be determined when the district first adopted the AEO and used thereafter without updating. In light of this issue, the panel estimated models that included predictors based on school meals certification data in the CCD ("FRPL predictors"), as well as models that excluded such predictors.

The results of our exploratory assessment of predictive models indicate that a relatively simple model without any FRPL predictors explains about 40 percent of the variability across districts in ACS-CCD differences according to either an R^2 or adjusted R^2 goodness-of-fit statistic.[19] Adding

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[17]The difference between the district's ACS and CCD estimates might be substantially different from $0.35 as a result of sampling error and systematic effects not captured by the model.

[18]A similar issue pertains to districts that have adopted Provision 2 or 3 and are no longer in the base year.

[19]The R^2 statistic ranges from 0 to 1 and is often expressed as a percentage (from 0 to 100 percent). If all the predictors in a model are uncorrelated with whatever we are trying to predict, R^2 will be 0. In contrast, R^2 will be 100 percent if the predictors can perfectly predict

a large number of interaction and quadratic terms increases the adjusted R^2 from about 0.40 to about 0.56. Not surprisingly, adding FRPL predictors substantially enhances the predictive ability of the model. Although a simple model with FRPL predictors explains only about three-fifths of the variability in ACS-CCD differences, a model with many interaction and quadratic terms has an adjusted R^2 of nearly 0.75.[20]

Although even a well-developed predictive model might not be able to account for almost all of the variability in the differences between ACS and administrative estimates across districts, our exploratory results suggest that such a model might still be able to play a useful role in adjusting ACS estimates. This potential role of a predictive model is addressed in Chapter 6.

PRECISION, INTERTEMPORAL STABILITY, TIMELINESS, AND RELATIVE PERFORMANCE OF ESTIMATES

Precision, Intertemporal Stability, and Timeliness

Estimates generally become more precise, that is, less subject to sampling variability, as the number of observations on which they are based becomes larger. In the ACS, samples generally are larger for areas with larger populations. Furthermore, for a given area, a 5-year estimate is based on a larger sample than a 3-year estimate, which is based on a larger sample than a 1-year estimate, assuming that the area is large enough to have 1- and 3-year estimates. Although a 5-year estimate is more precise because it is based on more data (a larger sample), it also is less timely because it is based on older data (from the last 5 years rather than the last 1 or 3 years). Thus as noted earlier, there is a trade-off between precision and stability on the one hand and timeliness and responsiveness to real change on the other. If stability is achieved by

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whatever we are trying to predict. R^2 necessarily increases as linearly independent predictors are added to a model, and it necessarily reaches 100 percent when the number of linearly independent predictors equals the number of observations for which we are making predictions, although it can reach 100 percent with a smaller number of predictors. The adjusted R^2 statistic corrects for the loss in degrees of freedom—the number of observations minus the number of predictors—as predictors are added to the model. The adjusted R^2 statistic is generally preferred to the (unadjusted) R^2 statistic because the adjusted R^2 statistic does not necessarily increase when a poor predictor is added to the model.

[20]For some models, the unadjusted R^2 is greater than 0.9. However, the number of predictors in those models is very large relative to the number of districts included in the analysis. The analysis of models without FRPL predictors included 1,433 districts, while, as a result of missing data on the FRPL predictors, the analysis of models with such predictors included 1,366 districts. The simplest model estimated had 73 predictors and the most complex between 700 and 800 predictors.

sacrificing responsiveness to real changes in socioeconomic conditions, a district may be underreimbursed when conditions have deteriorated, as in the recent "Great Recession," and overreimbursed when conditions have improved. Yet excessive volatility can hamper effective planning and program administration.

The analyses the panel could conduct to explore these issues in our evaluation of the ACS estimates were limited by the available data. Although we had five sets of 1-year estimates, they were available only for the large districts. Three-year estimates were available only for the large and medium districts, and there were just three sets of such estimates. For small districts, we had only 5-year estimates, and for those districts as well as the larger districts, we had just one set of 5-year estimates. Furthermore, each set of estimates spanned only a 5-year period, limiting our ability to assess the effects of, for example, a different trend in the percentage of students eligible for free or reduced-price meals.[21] In light of these data limitations, we focused our analyses on the 1-year ACS estimates, relying on modeling assumptions to derive many of our results pertaining to 3- and 5-year estimates. Because the 1-year estimates were available for large districts only, such an approach may limit the ability to generalize some of our results to medium and small districts. We included both high and very high FRPL large districts in our analyses. Appendix F presents our technical approach to these analyses in more detail.

To assess the stability of estimates over time, we calculated standard deviations of detrended year-to-year changes. As noted earlier, administrative estimates have no sampling variation, but they do vary from year to year because of real changes in socioeconomic conditions that affect eligibility and participation rates (as well as variation in nonsampling error, such as certification error). Thus, we expect CCD estimates to vary over time, and we obtained a standard deviation of the year-to-year change in the CCD BRR of nearly $0.13 for large districts, which is 7.6 percent of the average BRR for such districts. For medium districts, the standard deviation is about $0.13 (7.9 percent of the average BRR), and for small districts, it is nearly $0.17 (10.3 percent of the average BRR).

Like CCD estimates, ACS estimates vary over time because of real changes in socioeconomic conditions, as well as variation in nonsampling error, although the sources of the latter are probably more numerous and variable for ACS than for CCD estimates. Unlike CCD estimates, ACS estimates also will vary because of sampling error. According to the panel's calculations, the standard deviation of year-to-year change for ACS 1-year BRR estimates is about $0.19 for large districts, while the standard devia-

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[21]As documented above, this fraction was rising during the 5-year period. It rose by 3.4 and 6.9 percentage points among the very high and high FRPL districts, respectively.

tions for the ACS 3- and 5-year estimates are, respectively, $0.07 and $0.05. These are 11.3 percent, 4.3 percent, and 2.9 percent, respectively, of the average BRR for large districts.[22] For medium districts, the standard deviations of year-to-year change for the ACS 3- and 5-year estimates are $0.13 and $0.07, respectively, which are 7.9 and 4.2 percent, respectively, of the average BRR. The standard deviation of year-to-year change for the ACS 5-year estimates is $0.15 (9.3 percent of the average BRR) for small districts.

These results suggest that, relative to the intertemporal changes normally experienced by a district as reflected in administrative data, the typical large district would likely experience less variability if it used 3- or 5-year ACS estimates but greater variability if it used 1-year ACS estimates.[23] The typical medium district would experience about the same variability as is normal if it used 3-year ACS estimates and less variability than is normal if it used 5-year ACS estimates. The typical small district would experience somewhat less than normal variability if it used 5-year ACS estimates. In other words, for the typical district in each size category, the ACS can provide estimates that are as stable as estimates based on districts' administrative procedures.

It is important to emphasize that these estimates of intertemporal variability pertain to a typical district in each size category, that is, a district with the median enrollment among the districts in that category. Although it appears that ACS 5-year estimates are likely to be sufficiently stable for even a typical small district, it is possible that such estimates will fluctuate excessively for the smallest small districts. To determine whether there may be a size threshold below which the ACS 5-year estimates are too unstable, we fit a model relating the estimated variability of a district's ACS BRR estimate to the district's enrollment (as described in detail in Appendix F). From this model, we derived Table 4-8, which shows how the standard deviation of the 1-year change in ACS 5-year estimates (say, between an estimate for 2005-2009 and an estimate for 2006-2010) would vary with enrollment. The table also displays the coefficient of variation (CV), which is the standard deviation relative to an average BRR of $1.65. Figure 4-5 graphs the estimated relationship between the CV and enrollment.[24]

As expected, variability falls as enrollment increases and rises as enrollment decreases. According to Table 4-8, a district with only 100 stu-

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[22]To facilitate comparisons across estimates, we used the average BRR from the CCD for calculating these relative standard deviations. The ratio of a standard deviation to a mean is often called the "coefficient of variation" (CV).

[23]The "typical" large district is at the median enrollment among large districts.

[24]The relationship is approximately linear when we plot the inverse of the enrollment and the squared CV.

TABLE 4-8 Intertemporal Variability of ACS 5-Year Estimates, by Enrollment

Enrollment	Variability of 1-Year Change in ACS 5-Year Estimates of BRR	
	Standard Deviation ($)	Coefficient of Variation (%) (relative to BRR of $1.65)
100	0.34	20.5
200	0.25	15.1
400	0.18	11.2
800	0.14	8.3
1,600	0.10	6.3
3,200	0.08	4.8
6,400	0.06	3.8
12,800	0.05	3.2

NOTE: ACS = American Community Survey; BRR = blended reimbursement rate.
SOURCE: Prepared by the panel.
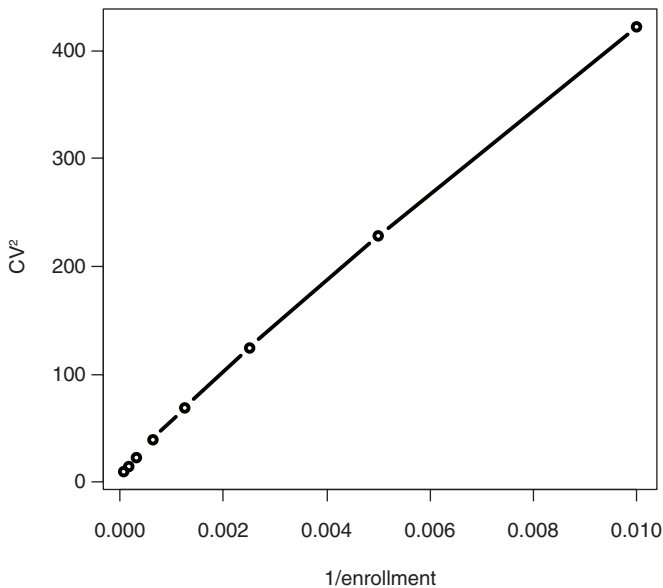
FIGURE 4-5 Intertemporal variability of ACS 5-year estimates: Squared coefficient of variation of year-to-year change in blended reimbursement rate versus inverse of enrollment.
NOTE: CV = coefficient of variation.
SOURCE: Prepared by the panel using data in Table 4-8.

dents has a standard deviation of $0.34, while a district with nearly 13,000 students has a standard deviation of just $0.05. As noted above, the standard deviation of the year-to-year change in the CCD BRR for the typical small district is $0.17, and the CV is 10.3 percent. However, the CV is 11.6 percent for a typical small district with enrollment below the median for small districts.[25] According to Table 4-8, this CV of 11.6 percent is slightly higher than the CV of the year-to-year change in ACS 5-year estimates for a district with an enrollment of 400. This implies that for districts with enrollments of 400 or higher, ACS 5-year estimates will probably be as stable as or more so than the districts' administrative estimates.[26]

Of course, some of the stability of the ACS 5-year estimates is achieved by averaging the most recent data with older data and thereby sacrificing some timeliness when socioeconomic conditions are improving or deteriorating substantially. Below, we consider measures of accuracy that reflect both the precision and stability of estimates on the one hand and their timeliness on the other.

Relative Performance

The analyses discussed above focused on the 1-, 3-, and 5-year direct ACS estimates and on comparisons of those estimates with estimates based on administrative (CCD) data. In addition to the direct estimates, however, the Census Bureau derived and provided ACS model-based estimates of the percentages of students eligible for free and reduced-price meals using an adaptation of the Small Area Income and Poverty Estimates (SAIPE) models and methods, as described in Chapter 3 and Appendix C. Although model-based estimates are subject to the same disclosure review process as other estimates produced by the Census Bureau, the use of statistical models helps preserve the confidentiality of survey responses and thus the privacy of respondents. Therefore, model-based estimates are available for every year for nearly every school district. Because such estimates are available for every year, they may be especially useful to small districts, which otherwise have only 5-year estimates

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[25]The CV is 8.7 percent for districts above the median.

[26]Figure 4-5 could be used to provide more specific results for individual districts considering whether to adopt the AEO. The inverse of a district's actual enrollment and the square of the CV based on its actual BRRs calculated from its administrative data could be plotted on the graph. If the plotted point were above the curve, the district might experience less intertemporal variability—that is, greater stability—with ACS estimates than it has been experiencing with administrative estimates. However, if the plotted point were below the curve, the ACS estimates might be less stable than the administrative estimates. This analysis could be performed by the AEO Calculator proposed in Chapter 5.

that potentially respond very slowly to changing socioeconomic conditions. Accordingly, our empirical evaluation of the model-based estimates focused on their performance for small districts.

Table 4-9 displays average differences between ACS model-based estimates and CCD estimates for small districts, as well as the average differences between 5-year ACS direct estimates and CCD estimates for those districts. The table is similar to the previously presented tables (Tables 4-1 through 4-4) that displayed average differences between ACS direct estimates and CCD estimates.[27]

For the model-based estimates, we can average the average differences across the 5 years. This average of averages for the BRR is about –$0.22 for the high FRPL districts, which is roughly 10 percent higher than the average difference for the ACS 5-year estimates. For the very high FRPL districts, however, the average of the average differences for the model-based BRR estimates is –$0.54, 20 to 25 percent greater than the average difference for the ACS 5-year estimates. Examination of the first two rows of estimates in Table 4-9 suggests that the performance of the model used in deriving estimates of the percentage of students eligible for free meals needs further assessment and improvement.

The objective of model-based estimation is to improve accuracy through the use of statistical models to "borrow strength" across geographic areas (or other estimation domains, such as time periods) in order to improve precision and reduce random error. In the process, the use of such models may introduce (additional) bias—that is, persistent, systematic error—in the estimates for individual areas, but the loss in accuracy due to modeling bias should be offset by the gain in accuracy due to increased precision. Moreover, the biases for individual areas should largely average out across areas in general and certainly if estimates at one level of geography are benchmarked to estimates at a higher level of geography, as is standard practice. The panel found, however, that the average of the average differences between ACS model-based estimates and CCD estimates across all small very high FRPL districts is substantially greater than the average difference between ACS 5-year direct estimates for 2005-2009 and CCD estimates for 2009-2010. This troubling result, coupled with the encouraging finding that the model-based estimates are more stable than the ACS 5-year estimates, led us to recommend in Chapter 6 that further research on model-based estimation for the development of eligibility estimates for the schools meals programs be undertaken if FNS decides to proceed with implementing the AEO. In our

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[27]The ACS model-based estimates for 2005 and 2006, for example, were compared with CCD estimates for 2005-2006 and 2006-2007, respectively. The ACS 5-year estimates for 2005-2009 were compared with CCD estimates for 2009-2010.

TABLE 4-9 Average Differences Between ACS Direct and Model-Based Estimates and CCD Estimates for Small Districts

Estimand	5-Year Estimates	Model-Based Estimates				
		2005	2006	2007	2008	2009
Very High FRPL Districts						
Percentage free	-22.20	-23.60	-23.88	-24.59	-24.76	-26.35
Percentage reduced price	3.75	1.52	1.17	1.93	0.64	2.64
Percentage free or reduced price	-18.45	-22.08	-22.70	-22.66	-24.11	-23.71
BRR, $	-0.44	-0.52	-0.53	-0.54	-0.56	-0.56
High FRPL Districts						
Percentage free	-10.22	-8.20	-8.44	-9.06	-9.70	-11.42
Percentage reduced price	2.15	0.37	0.01	-0.10	-0.79	0.05
Percentage free or reduced price	-8.08	-7.83	-8.42	-9.16	-10.49	-11.37
BRR, $	-0.20	-0.18	-0.20	-0.21	-0.24	-0.27

NOTES: All differences are statistically significant (different from zero) at the 0.01 level, except for the differences pertaining to the model-based estimates of percentage reduced price for 2006, 2007, and 2009 for high FRPL districts. ACS = American Community Survey; BRR = blended reimbursement rate; CCD = Common Core of Data; FRPL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

analyses of the stability of estimated BRRs, we found that the standard deviation of year-to-year change in model-based estimates is about $0.13 (8 percent relative to the average BRR) for small districts. This is less than the standard deviation of roughly $0.15 (9.3 percent of the average BRR) that we estimated for ACS 5-year estimates for small districts, presented earlier.

Based on these results of our empirical evaluation and our review of the available documentation, we concluded that the ACS model-based estimates are not ready for use in an AEO at present. From the beginning, we knew that the time and resources available to the Census Bureau for developing and evaluating models and estimation procedures were limited and that the estimates the Census Bureau provided might represent a proof of the concept that model-based estimation could be a useful approach in the future. Appendix C documents the research done by the Census Bureau and indicates specifically where additional research might prove valuable.

If the model-based estimates are not yet suitable for use, small districts have no alternative to using the 5-year estimates.[28] However, medium districts have not only 5-year estimates but also 3-year estimates, while large districts have 1-, 3-, and 5-year estimates. From the empirical analyses of 1-year estimates for large districts described briefly above and in detail in Appendix F, the panel calculated root mean squared errors (RMSEs) for the different direct estimators for large and medium districts, relying on modeling assumptions for some of the calculations given the limited data available to us.[29] We found that if the bias (that is, systematic difference) associated with the particular trend observed during the 5-year period spanned by the estimates is ignored, the RMSEs for the 1-, 3-, and 5-year estimators of BRRs are $0.170, $0.135, and $0.124, respectively, for large districts. Thus the longer the time span covered by an estimator, the lower is its RMSE (because it is more stable). When the bias associated with the specific observed trend is included, the respective RMSEs are $0.170, $0.152, and $0.164. During this particular period, the trend was sufficiently strong that the 5-year estimates have a higher RMSE than the 3-year estimates, and the RMSE for the 5-year estimates is nearly as high

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[28]Nonetheless, as noted above, BRRs based on ACS 5-year estimates are likely to be more stable than BRRs based on administrative certification percentages for many small districts.

[29]Mean squared error (MSE) is a commonly used measure of the total error (that is, the difference, taking account of both bias and variance, between an estimate [e.g., an ACS 1-year estimate] and what the "true" quantity would be without error). For an unbiased estimate, MSE is equivalent to the variance. RMSE is a commonly used measure of the total error that is expressed in the same units as the quantity being measured instead of squared units.

as the RMSE for the 1-year estimates.[30] For medium districts, the RMSEs for 3- and 5-year estimates are $0.168 and $0.147, respectively, when the bias from the trend is ignored and $0.179 and $0.173, respectively, when it is not. As expected, the additional bias due to lack of timeliness is greatest for the 5-year estimates because they average data over a longer period of time, and as documented above, there was a substantial increase during the 5-year period in the percentage of students certified for free or reduced-price meals.

Another consideration in evaluating estimates is the time lag between their reference period and when they would be used to determine reimbursements under the AEO. Although most of our analyses compare, for example, ACS estimates that include 2009 in the reference period—i.e., the 2009, 2007-2009, and 2005-2009 estimates—with SY 2009-2010 administrative estimates, AEO claiming percentages based on those particular ACS estimates would be used 2 years later—for SY 2011-2012.[31] Because no such lag is associated with administrative estimates, the lag in the ACS estimates is an additional source of error, specifically, a timeliness bias. For the 3- and 5-year ACS estimates, the lag bias adds to the timeliness bias associated with averaging the most recent data with older data. But the lag bias also pertains to the 1-year estimates even though they do not have the timeliness bias associated with averaging over multiple years of data.

Based on the limited data available to the panel and the modeling assumptions described in Appendix F, we estimated RMSEs that take into account the 2-year time lag between the most recent reference year of a set of ACS estimates and the year when the estimates would be used to establish AEO claiming percentages. For 1-year estimates for large districts, taking the lag into account increases the RMSE by 51 percent, from $0.170 to $0.256.[32] For 3-year estimates, taking the time lag into account increases the RMSE from $0.152 to $0.205 (35 percent) for large districts and from $0.179 to $0.214 (20 percent) for medium districts.[33] These results demonstrate that, as expected, the estimated error for the 3-year estimates is less affected by the time lag than is the estimated error for the 1-year estimates. The reason is that averaging over time causes estimates to be more stable and thus more highly correlated over time, reducing the error associated with the time lag. For this reason, we also expect the additional error from the time lag to be even smaller for

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[30]Taking the trend into account does not change the RMSE for 1-year estimates because those estimates do not average across years.

[31]The sets of estimates for 2009 were released in late 2010 and early 2011.

[32]The latter RMSE is conditional on the specific trend observed over the years for which we had estimates. Had there been no trend, the time lag would have contributed no error.

[33]All of these RMSEs are conditional on the specific trend observed over the years for which we had estimates.

5-year estimates than for 3-year estimates. We had only one set of 5-year estimates available to us, however, and could not calculate RMSEs for 5-year estimates that include the error attributable to a 2-year time lag. Nonetheless, because the RMSE for 5-year estimates for medium districts is less than the RMSE for 3-year estimates when the time lag is ignored, we would expect the advantage of the 5-year estimates to be even greater if we could take the time lag into account. Thus, medium districts should generally prefer the 5-year estimates to the 3-year estimates. In contrast, although large districts should generally prefer 3-year estimates to 1-year estimates, whether such districts should prefer 3- or 5-year estimates is less clear. When the time lag is ignored, the 3-year estimates appear to strike the most effective compromise between precision and stability on the one hand and responsiveness to change on the other. If the time lag could be taken into account, however, the 5-year estimates might have a smaller RMSE. As demonstrated above, the 5-year estimates are more stable, an important consideration for many districts.[34]

THE ROLE OF PARTICIPATION

Under the AEO, the purpose of using the ACS is to obtain estimates for claiming reimbursement for meals served when application, certification, and other procedures are no longer conducted and meals are provided free of charge to all students. The ACS provides estimates of eligible students based on the data on income and SNAP and welfare program participation collected by the survey, although as documented earlier in this chapter, the ACS eligibility estimates are substantially different, on average, from administrative certification estimates. The ACS does not collect data on participation by students in the school meals programs, yet it is participation that is the basis for reimbursement of districts for the meals they serve under traditional operating procedures or Provisions 2 and 3.

In our earlier depiction of the school meals programs (refer back to Figure 2-1 in Chapter 2), the ACS provides estimates (with error) of the distribution denoted by "E_T: All Students—True Eligibility," whereas administrative data on enrolled students by certification status provide the distribution denoted by "C_O: Approved Students—Observed." Neither distribution, however, reflects the participation patterns of students that are reflected in the distribution of meals served, which is "M_O: Meals Served—Observed under Traditional Approach." Moreover, neither that distribution nor either distribution of students may accurately reflect the changes in participation patterns that might occur when meals were

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[34]Large districts also have the option of creating their own 2-year or 4-year estimates.

offered free of charge to all students under the AEO, as denoted by "M_U: Meals Served—Universal Free Meals (Unobserved)."

Implementing the AEO and offering free meals to all students would lower the price of purchasing a meal for students previously paying the reduced price and, especially, for those previously paying full price. Therefore, given standard economic assumptions about the role of prices in the demand for school meals (that school meals are a normal good for which demand increases when the price decreases), implementing the AEO would be expected to increase participation among all students not already approved to receive free meals. In addition, the availability of free school meals for all students might increase participation among those previously eligible for free meals—as well as those previously paying a reduced price or full price—because it would reduce the family's burden of applying for benefits and remove any perceived stigma associated with participating in the program. Furthermore, participation might increase if eliminating the need to ascertain the eligibility status of students as they received or purchased meals allowed cafeteria lines to move more quickly so that it was easier to eat a meal during the allotted time for lunch.[35] Thus, we would expect participation rates and the distribution of meals served under the AEO to be different from participation rates and the distribution of meals served under traditional operating procedures.

This likelihood could have important implications for establishing accurate claiming percentages—ones that accurately reflect M_U, the distribution of meals served when meals are offered free of charge to all students.[36] Offering free meals to all students might increase participation rates among students formerly paying full price much more substantially than it increased participation rates among students formerly paying a reduced price or nothing. Then, even if the distribution of meals served under traditional operating procedures (M_O) were substantially different from the distributions of eligible and certified students (E_T and C_O, respectively), the new distribution of meals served under the AEO might be fairly similar to, say, the current distribution of certified students. Alternatively, the distribution of meals served might still be substantially different from the distributions of eligible and certified students.

This section presents the panel's analyses of participation. The results indicate that the role of participation and the distinctions between the different distributions of students and the different distributions of meals

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[35]Attendees at the workshop sponsored by the panel mentioned slow cafeteria lines as a factor limiting participation in some schools.

[36]As shown in Chapter 5, meals served claiming percentages can be expressed in terms of the product of eligibility percentages and participation rates.

served are important to consider in assessing and, potentially, implementing the AEO.

As documented in Chapter 2 (see Table 2-4), National School Lunch Program (NSLP) participation rates vary substantially at the national level across the free, reduced-price, and full-price categories. Over the past 6 years, the participation rate among students approved for free meals has been at least 1.7 times the rate among students paying full price. The implication is that the distribution of meals served across categories (M_O in Figure 2-1) is very different from the distribution of students across categories (C_O in Figure 2-1). According to Tables 2-1 and 2-3 in Chapter 2, about half of all enrolled students were approved to receive free or reduced-price meals in 2010, but they were served about 65 percent of all NSLP school lunches.

The data available to the panel for more detailed analyses of participation were limited. Data from form FNS-10 were available only at the state level, and we were not successful in obtaining district-level data for all districts in a state. However, we did have the district- and school-level data provided by our case study districts. This section focuses on several results that are illustrated effectively by our analyses of SY 2008-2009 district-level administrative data for the case study districts. An advantage of using administrative data for not only meals served but also certified students is that the role of participation is highlighted more clearly than it would be if we used ACS eligibility estimates. The latter are subject to sampling error, and as demonstrated earlier in this chapter, are systematically different from the administrative estimates of certified students.

Table 4-10 shows that participation rates in the case study districts—as in the nation as a whole—are much higher for students certified for free or reduced-price meals than for those paying full price. Thus, comparing the distributions of certified students and meals served, we see that the percentage of meals served to students paying full price is smaller—by 9 to 18 percentage points—than the percentage of students paying full price.

When assessing whether and how to adopt the AEO, it is important to note that these substantially different distributions would, if used to establish claiming percentages, imply very different reimbursement rates. Table 4-10 presents BRRs based on both distributions—that of certified students and that of meals served. We see that the BRRs based on meals served—that is, the BRRs that reflect participation—are substantially greater than the BRRs based just on the distribution of certified students. The differences between the two BRRs for each district range from roughly $0.20 to $0.40 or 10 to 19 percent—about as large as the average differences between BRRs based on ACS eligibility estimates and administrative certification estimates. Thus, failing to take participation into

TABLE 4-10 BRRs Based on Certified Students Versus BRRs Based on Meals Served: Illustration with Case Study Districts

District	Participation Rates (%)			Claiming Percentages (%) Certified Students			Claiming Percentages (%) Meals Served		
	Free	Reduced Price	Full Price	Free	Reduced Price	Full Price	Free	Reduced Price	Full Price
Austin, Texas	86	72	34	56	8	37	73	8	19
Chatham County, Georgia	75	72	48	59	9	32	67	10	23
Norfolk, Virginia	77	71	43	48	11	41	59	12	29
Omaha, Nebraska	92	84	61	50	11	39	58	12	30
Pajaro Valley, California	68	52	23	59	9	32	77	9	14

BRRs

District	Certified Students ($)	Meals Served ($)	Difference ($)	Percentage Difference
Austin, Texas	1.71	2.12	−0.41	−19
Chatham County, Georgia	1.80	2.01	−0.21	−10
Norfolk, Virginia	1.59	1.87	−0.29	−15
Omaha, Nebraska	1.64	1.84	−0.20	−11
Pajaro Valley, California	1.81	2.22	−0.41	−19

NOTE: BRRs = blended reimbursement rates.
SOURCE: Prepared by the panel.

account when establishing claiming percentages under the AEO might cause districts to be underreimbursed by large amounts.

One solution to this potential problem that could be implemented for all districts in the country and would require only data that are readily available in national data files would be to derive claiming percentages by using not only estimates of the distribution of students for each district but also national or state participation rates. Table 4-11 compares such BRRs based on national participation rates with the BRRs based on each district's actual participation rates (that is, the BRRs based on meals served). Table 4-12 presents the results for BRRs based on state participation rates, and Table 4-13 includes all of the BRRs from the previous three tables. To supplement results for the case study districts, Table 4-14 presents state-level BRRs based on the distribution of certified students, national participation rates applied to each state's distribution of certified students, and each state's actual participation rates applied to its distribution of certified students (which equals the BRR derived from the actual distribution of meals served).

These tables indicate that taking participation into account—even using a fairly crude approach—typically produces a BRR that is closer to the actual value based on meals served than is a BRR that ignores participation. For the particular school year that we considered, this is true for all the case study districts and most of the states. Because participation rates vary across districts and states, however, a crude approach does not always work well, and sometimes does not work at all. Considering the Austin school district, for example, we see that while the BRR based on the distribution of certified students is low by 19 percent according to Table 4-10, the BRR that incorporates state participation rates is more accurate but still low by 14 percent (see Table 4-12). For some states, such as Delaware and Texas, a BRR that ignored participation would lead to underreimbursement, while a BRR based on national participation rates would lead to a larger overreimbursement. Although limited to states and just a few districts, these findings suggest that a one-size-fits-all approach for taking account of participation might not work well.

As discussed above, we cannot assess the effects of participation under traditional operating procedures only. We must also consider the potential implications of changes in participation rates when meals are offered free of charge to all students under the AEO. Before doing so, however, we should note that the effects of participation as reflected in the difference between the distribution of students and the distribution of meals served generally are smaller as the percentage of students certified for free or reduced-price meals becomes larger. Although this percentage is not terribly high for each case study district as a whole (for reasons explained in the discussion of our selection of case study districts

TABLE 4-11 Use of National Participation Rates to Take Participation into Account: Illustration with Case Study Districts

| | Participation Rates | | | | | |
| | District (%) | | | National (%) | | |
District	Free	Reduced Price	Full Price	Free	Reduced Price	Full Price
Austin, Texas	86	72	34	75	67	43
Chatham County, Georgia	75	72	48	75	67	43
Norfolk, Virginia	77	71	43	75	67	43
Omaha, Nebraska	92	84	61	75	67	43
Pajaro Valley, California	68	52	23	75	67	43

| | Claiming Percentages (based on meals served) | | | | | |
| | District Participation Rates (%) | | | National Participation Rates (%) | | |
District	Free	Reduced Price	Full Price	Free	Reduced Price	Full Price
Austin, Texas	73	8	19	67	8	25
Chatham County, Georgia	67	10	23	69	9	22
Norfolk, Virginia	59	12	29	59	12	29
Omaha, Nebraska	58	12	30	61	12	27
Pajaro Valley, California	77	9	14	69	9	21

| | BRRs | | | |
District	Actual ($)	Illustrative ($)	Difference ($)	Percentage Difference
Austin, Texas	2.12	1.98	−0.15	−7
Chatham County, Georgia	2.01	2.05	0.04	2
Norfolk, Virginia	1.87	1.87	−0.01	0
Omaha, Nebraska	1.84	1.91	0.07	4
Pajaro Valley, California	2.22	2.05	−0.17	−8

NOTE: BRRs = blended reimbursement rates.
SOURCE: Prepared by the panel.

in Chapter 3), there are schools within each case study district that have very high percentages. Table 4-15 presents illustrative results from 30 such schools that have been sorted from lowest to highest percentage of students certified for free or reduced-price meals.[37] When this percentage is 85 or higher (and sometimes when it is lower), the difference between

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[37]These 30 schools are not all of the schools with very high percentages of students certified for free or reduced-price meals. Rather, they are a subset chosen to illustrate the differences in BRRs across different values of this certification percentage and different sets of participation rates. The schools are not identified in the table to preserve confidentiality.

TABLE 4-12 Use of State Participation Rates to Take Participation into Account: Illustration with Case Study Districts

| | Participation Rates | | | | | |
| | District (%) | | | State (%) | | |
District	Free	Reduced Price	Full Price	Free	Reduced Price	Full Price
Austin, Texas	86	72	34	68	66	54
Chatham County, Georgia	75	72	48	84	75	58
Norfolk, Virginia	77	71	43	83	74	45
Omaha, Nebraska	92	84	61	88	78	67
Pajaro Valley, California	68	52	23	66	60	25

| | Claiming Percentages (based on meals served) | | | | | |
| | District Participation Rates (%) | | | State Participation Rates (%) | | |
District	Free	Reduced Price	Full Price	Free	Reduced Price	Full Price
Austin, Texas	73	8	19	61	8	31
Chatham County, Georgia	67	10	23	66	9	25
Norfolk, Virginia	59	12	29	60	12	28
Omaha, Nebraska	58	12	30	56	11	33
Pajaro Valley, California	77	9	14	75	10	15

| | BRRs | | | |
District	Actual ($)	Illustrative ($)	Difference ($)	Percentage Difference
Austin, Texas	2.12	1.83	−0.29	−14
Chatham County, Georgia	2.01	1.98	−0.04	−2
Norfolk, Virginia	1.87	1.89	0.02	1
Omaha, Nebraska	1.84	1.78	−0.06	−3
Pajaro Valley, California	2.22	2.20	−0.03	−1

NOTE: BRRs = blended reimbursement rates.
SOURCE: Prepared by the panel.

the BRRs based on the distribution of certified students and the distribution of meals served tends to be small in percentage terms, although it can still be as large as $.20 per meal.

In light of the evidence that taking participation into account is potentially important, the panel explored crude approaches based on national and state participation rates because they require only data readily available in national data files and could be implemented as part of a process for producing estimates for all districts in the country. Although a one-size-fits-all method is attractive for its simplicity, it is not necessary to take such an approach if a more tailored alternative offers significant

TABLE 4-13 Alternative BRRs for Case Study Districts

| | BRRs ($) | | | |
| | | Adjusted Using | | |
District	Certified Students	National Participation Rates	State Participation Rates	Actual Meals Served
Austin, Texas	1.71	1.98	1.83	2.12
Chatham County, Georgia	1.80	2.05	1.98	2.01
Norfolk, Virginia	1.59	1.87	1.89	1.87
Omaha, Nebraska	1.64	1.91	1.78	1.84
Pajaro Valley, California	1.81	2.05	2.20	2.22

| | Difference from Actual Meals Served BRRs ($) | | |
| | | Adjusted Using | |
District	Certified Students	National Participation Rates	State Participation Rates
Austin, Texas	−0.41	−0.15	−0.29
Chatham County, Georgia	−0.21	0.04	−0.04
Norfolk, Virginia	−0.29	−0.01	0.02
Omaha, Nebraska	−0.20	0.07	−0.06
Pajaro Valley, California	−0.41	−0.17	−0.03

NOTE: BRRs = blended reimbursement rates.
SOURCE: Prepared by the panel.

advantages. With respect to the issue of taking participation into account, districts know their own participation rates (at least for the prior school year) and could use them in combination with ACS eligibility estimates to develop AEO claiming percentages. Although such participation rates have the advantage of being specific to each district, a potentially important limitation is that they would not reflect the effects on participation of offering free meals to all students. That is, they would not reflect the differences between the M_O and M_U distributions depicted in Figure 2-1.

The panel was unable to identify reliable, broadly applicable data that might be used to predict accurately for individual districts the effects on participation of offering free meals to all students. In fact, we found little information to inform analyses that might illustrate the potential effects of providing universal free meals under the AEO. Therefore, to gain some sense of how the BRRs of the case study districts might be affected by changing participation rates, we simply assumed that the rates for the free and full-price categories would increase by 5 and 10 percentage points, respectively, while the rate for the reduced-price category would rise to

within 3 percentage points of the new rate for the free category. The results of this purely illustrative analysis are shown in Table 4-16. The first three data columns display the districts' actual SY 2008-2009 participation rates under traditional operating procedures. The next three columns reflect the assumed changes in participation rates due to adoption of the AEO and the offer of free meals to all students. After several columns displaying the resulting claiming percentages and BRRs, the last two columns indicate that the effects on BRRs might be fairly small, at least compared with differences between BRRs based on ACS estimates and those based on administrative estimates or BRRs that take participation into account (even crudely) and those that do not take participation into account. Similarly, for schools in the case study districts—specifically, the 30 schools with very high percentages of students certified for free or reduced-price meals—these same increases in participation rates under the AEO would have only a small effect on BRRs (see Table 4-17). Of course, a district or school could experience larger changes in participation rates and, therefore, larger effects on its BRR due to adoption of the AEO.

Another way to examine these results is to consider whether the changes in participation rates induced by offering free meals to all students under the AEO might bring the distribution of meals served close to the distribution of certified/eligible students. If that were to occur, claiming percentages could be based on the distribution of certified/eligible students, and it would not be necessary to take participation into account. Tables 4-18 (for the case study districts) and 4-19 (for schools within the districts) present BRRs from the previous tables and compare the BRRs based on the distribution of meals served—both pre- and post-AEO— with those based on the distribution of certified students. As expected in light of the previous comparisons, the post-AEO meals-served BRRs generally are only a little closer to the certified-students BRRs than are the pre-AEO meals-served BRRs. Although both meals-served BRRs are close to the certified-students BRR for some of the schools with very high percentages of students certified for free or reduced-price meals, the difference between the post-AEO meals-served BRR and the certified-students BRR is substantial for other schools and each of the districts as a whole. In such instances, the post-AEO meals-served BRR and the certified-students BRR would be equal only if the offer of free meals under the AEO induced a very substantial increase in the participation rate among students formerly paying full price so that their participation rate would be roughly equal to that for students who had already been receiving free meals.[38]

The panel's analyses focused on the BRR, which is the average reim-

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[38]This would increase the percentage of meals served to students formerly paying full price and lower the meals-served BRR to the level of the certified-students BRR.

TABLE 4-14 Alternative BRRs for States

State	Actual Participation Rates (%)			BRRs ($)		Actual Meals Served	Difference from Actual Meals Served BRR ($)	
	Free	Reduced Price	Full Price	Certified Students	Adjusted Using National Participation Rates		Certified Students	Adjusted Using National Participation Rates
Alabama	84	75	57	1.49	1.79	1.69	−0.20	0.09
Alaska	66	66	25	1.22	1.53	1.76	−0.54	−0.23
Arizona	86	74	35	1.37	1.67	1.83	−0.47	−0.16
Arkansas	84	74	49	1.53	1.82	1.80	−0.28	0.01
California	66	60	25	1.51	1.80	1.99	−0.48	−0.19
Colorado	75	64	26	0.97	1.26	1.53	−0.56	−0.27
Connecticut	83	73	40	0.96	1.24	1.34	−0.38	−0.10
Delaware	70	73	61	1.38	1.69	1.46	−0.08	0.22
District of Columbia	72	61	41	1.74	2.00	2.00	−0.26	0.00
Florida	78	65	31	1.41	1.71	1.89	−0.48	−0.18
Georgia	84	75	58	1.50	1.80	1.70	−0.20	0.09
Hawaii	62	56	48	1.24	1.54	1.37	−0.13	0.17
Idaho	80	71	54	1.31	1.61	1.51	−0.20	0.10
Illinois	76	63	39	1.37	1.68	1.73	−0.36	−0.06
Indiana	67	58	65	1.40	1.70	1.41	−0.01	0.29
Iowa	80	77	63	1.02	1.31	1.14	−0.12	0.17
Kansas	81	74	55	1.16	1.46	1.37	−0.21	0.09
Kentucky	76	79	79	1.64	1.91	1.62	0.02	0.29
Louisiana	76	67	61	1.67	1.94	1.78	−0.11	0.16
Maine	72	62	40	1.14	1.44	1.46	−0.32	−0.02
Maryland	77	67	31	1.04	1.33	1.52	−0.48	−0.19
Massachusetts	78	65	40	0.99	1.28	1.34	−0.35	−0.05
Michigan	75	67	34	1.19	1.50	1.63	−0.44	−0.13
Minnesota	73	84	57	1.00	1.28	1.13	−0.14	0.15

Mississippi	85	75	51	1.77	2.03	2.00	-0.23	0.02
Missouri	80	73	55	1.27	1.58	1.48	-0.21	0.10
Montana	77	67	43	1.09	1.39	1.40	-0.31	-0.01
Nebraska	88	78	67	1.10	1.40	1.24	-0.14	0.16
Nevada	65	51	23	1.25	1.55	1.79	-0.54	-0.23
New Hampshire	79	67	45	0.76	0.99	1.00	-0.24	0.00
New Jersey	80	67	36	1.06	1.35	1.48	-0.42	-0.13
New Mexico	74	67	49	1.77	2.02	1.96	-0.19	0.06
New York	74	66	40	1.37	1.68	1.70	-0.32	-0.02
North Carolina	78	68	43	1.40	1.70	1.72	-0.32	-0.02
North Dakota	100	80	66	0.86	1.13	1.04	-0.18	0.09
Ohio	79	71	40	1.13	1.44	1.50	-0.37	-0.07
Oklahoma	72	69	50	1.53	1.82	1.73	-0.20	0.09
Oregon	72	61	31	1.30	1.60	1.74	-0.45	-0.14
Pennsylvania	78	72	47	1.08	1.38	1.35	-0.27	0.03
Rhode Island	76	65	28	1.17	1.47	1.71	-0.54	-0.23
South Carolina	81	70	45	1.48	1.78	1.79	-0.31	-0.01
South Dakota	82	78	65	1.11	1.41	1.23	-0.12	0.18
Tennessee	71	64	50	1.53	1.82	1.72	-0.19	0.11
Texas	68	66	54	1.77	2.02	1.88	-0.11	0.14
Utah	75	72	50	1.03	1.32	1.24	-0.21	0.08
Vermont	78	67	43	0.99	1.27	1.28	-0.29	-0.01
Virginia	83	74	45	1.04	1.33	1.36	-0.32	-0.03
Washington	76	65	31	1.15	1.45	1.63	-0.48	-0.18
West Virginia	70	63	60	1.46	1.76	1.54	-0.08	0.22
Wisconsin	76	73	53	1.04	1.34	1.24	-0.20	0.10
Wyoming	80	71	53	0.98	1.26	1.19	-0.20	0.08
United States	75	67	43	1.35	1.66	1.66	-0.30	0.00

NOTE: BRRs = blended reimbursement rates.
SOURCE: Prepared by the panel.

TABLE 4-15 BRRs Based on Certified Students Versus BRRs Based on Meals Served: Illustration with Case Study District Schools

	Participation Rates (%)			Claiming Percentages Certified Students		
School	Free	Reduced Price	Full Price	Free	Reduced Price	Full Price
1	98	94	23	65	7	27
2	96	9	85	63	11	26
3	85	64	35	65	9	26
4	96	91	71	59	16	25
5	96	79	44	68	8	24
6	91	82	59	57	20	23
7	63	55	18	67	10	23
8	74	71	71	68	9	23
9	93	94	83	64	14	22
10	45	31	6	72	7	21
11	57	44	16	74	6	20
12	96	86	66	76	6	18
13	89	95	27	75	6	18
14	89	87	74	68	15	17
15	77	67	33	77	9	15
16	99	93	33	80	7	14
17	97	98	55	83	4	13
18	90	89	82	83	5	12
19	82	67	35	78	11	11
20	96	90	90	84	5	10
21	62	41	28	77	13	10
22	70	47	22	82	8	10
23	95	93	60	88	3	9
24	92	92	68	84	8	8
25	86	80	40	87	7	6
26	95	95	95	89	6	5
27	94	67	60	88	7	5
28	90	84	78	86	10	4
29	84	77	78	89	7	4
30	90	83	60	87	9	4

NOTE: BRRs = blended reimbursement rates.
SOURCE: Prepared by the panel.

Claiming Percentages Meals Served			BRRs			
Free	Reduced Price	Full Price	Certified Students ($)	Meals Served ($)	Difference ($)	Percentage Difference
83	9	8	1.92	2.36	–0.44	–19
72	1	27	1.94	1.97	–0.03	–1
79	8	13	1.95	2.26	–0.31	–14
64	17	20	1.95	2.06	–0.11	–5
80	8	13	2.01	2.27	–0.26	–11
64	20	17	1.97	2.12	–0.15	–7
82	10	8	2.01	2.36	–0.35	–15
69	9	22	2.02	2.03	–0.02	–1
66	15	20	2.03	2.07	–0.04	–2
90	6	3	2.08	2.49	–0.41	–17
87	6	7	2.10	2.41	–0.31	–13
81	5	14	2.14	2.25	–0.11	–5
86	8	6	2.14	2.41	–0.27	–11
70	15	14	2.14	2.20	–0.06	–3
85	8	7	2.22	2.39	–0.18	–7
88	7	5	2.24	2.44	–0.20	–8
88	4	8	2.27	2.39	–0.12	–5
84	5	11	2.28	2.31	–0.02	–1
85	10	5	2.29	2.43	–0.14	–6
85	5	10	2.33	2.34	–0.01	–1
85	10	5	2.31	2.44	–0.13	–5
91	6	3	2.34	2.49	–0.15	–6
91	3	6	2.37	2.44	–0.07	–3
86	8	6	2.37	2.42	–0.05	–2
90	7	3	2.42	2.50	–0.07	–3
89	6	5	2.45	2.45	0.00	0
91	6	3	2.45	2.50	–0.04	–2
87	9	4	2.45	2.46	–0.02	–1
90	7	4	2.47	2.48	–0.01	0
89	8	3	2.47	2.50	–0.03	–1

TABLE 4-16 Illustration of Potential Participation Effects of Universal Free Meals Under the AEO in Case Study Districts

| District | Participation Rates | | | | | |
| | Actual, Pre-AEO (%) | | | Illustrative, Post-AEO (%) | | |
	Free	Reduced Price	Full Price	Free	Reduced Price	Full Price
Austin, Texas	86	72	34	91	88	44
Chatham County, Georgia	75	72	48	80	77	58
Norfolk, Virginia	77	71	43	82	79	53
Omaha, Nebraska	92	84	61	97	94	71
Pajaro Valley, California	68	52	23	73	70	33

| District | Claiming Percentages (based on meals served) | | | | | |
| | Actual, Pre-AEO (%) | | | Illustrative, Post-AEO (%) | | |
	Free	Reduced Price	Full Price	Free	Reduced Price	Full Price
Austin, Texas	73	8	19	69	9	22
Chatham County, Georgia	67	10	23	65	9	26
Norfolk, Virginia	59	12	29	56	12	32
Omaha, Nebraska	58	12	30	56	12	32
Pajaro Valley, California	77	9	14	72	10	18

| District | BRRs | | | |
	Actual, Pre-AEO ($)	Illustrative, Post-AEO ($)	Difference ($)	Percentage Difference
Austin, Texas	2.12	2.05	−0.07	−3
Chatham County, Georgia	2.01	1.96	−0.05	−3
Norfolk, Virginia	1.87	1.81	−0.07	−4
Omaha, Nebraska	1.84	1.80	−0.04	−2
Pajaro Valley, California	2.22	2.13	−0.09	−4

NOTE: AEO = American Community Survey (ACS) Eligibility Option; BRRs = blended reimbursement rates.
SOURCE: Prepared by the panel.

bursement rate per meal. However, another potentially important consideration is that any changes in participation rates under the AEO could impact the total reimbursement received by a district by affecting not only the BRR but also the total number of meals served. Thus, a district would have to assess the cost implications of a change in the scale of food service operations. A large increase in the total number of meals served might require, for example, that more staff be hired or that the kitchen facilities be expanded.

SUMMARY AND CONCLUSIONS

The panel's evaluations of the ACS-based eligibility estimates encompassed a wide range of issues. The main results of our analyses include the following:

- ACS estimates are systematically different from administrative estimates for high and very high FRPL districts.
- BRRs based on ACS estimates of eligible students are substantially less than BRRs based on CCD estimates of certified students for high and very high FRPL districts, on average.
- Average ACS-CCD differences are larger for very high FRPL districts than for high FRPL districts.
- There are several potentially important sources of systematic differences between ACS and administrative estimates, and the effects of these sources are likely to vary across districts.
- A statistical model can explain a substantial fraction—but far from all—of the variability across districts in the differences between ACS and administrative estimates.
- Relative to the inter temporal changes in BRRs normally experienced by a district, as reflected in the administrative data on certified students, the typical large district would likely experience less variability if it used 3- or 5-year ACS estimates but greater variability if it used 1-year ACS estimates.[39] The typical medium district would experience about the same variability as normal if it used 3-year ACS estimates and less variability than normal if it used 5-year ACS estimates. The typical small district would experience somewhat less than normal variability if it used 5-year ACS estimates.
- For districts with enrollments of 400 or higher, ACS 5-year estimates would probably be as stable or more so than the districts' administrative estimates. The 5-year estimates might be less stable than administrative estimates for smaller districts.
- For small very high FRPL districts, average differences between model-based ACS estimates and CCD BRR estimates are substantially larger than average differences between ACS 5-year estimates and CCD estimates.
- Based on overall accuracy and consideration of error due to both variability and bias, the 5-year estimates would likely be more accurate than the 3-year estimates for medium districts. For large

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[39] As noted previously, a typical school in a category has an enrollment at about the median enrollment for schools in the category.

TABLE 4-17 Illustration of Potential Participation Effects of Universal Free Meals Under the AEO in Case Study District Schools

School	Participation Rates						Claiming Percentages Based on Meals Served		
	Actual, Pre-AEO (%)			Illustrative, Post-AEO (%)			Actual, Pre-AEO		
	Free	Reduced Price	Full Price	Free	Reduced Price	Full Price	Free	Reduced Price	Full Price
1	98	94	23	100	97	33	83	9	8
2	96	9	85	100	97	94	72	1	27
3	85	64	35	90	87	45	79	8	13
4	96	91	71	100	97	81	64	17	20
5	96	79	44	100	97	54	80	8	13
6	91	82	59	96	93	69	64	20	17
7	63	55	18	68	65	28	82	10	8
8	74	71	71	79	76	73	69	9	22
9	93	94	83	98	95	92	66	15	20
10	45	31	6	50	47	16	90	6	3
11	57	44	16	62	59	26	87	6	7
12	96	86	66	100	97	76	81	5	14
13	89	95	27	94	91	37	86	8	6
14	89	87	74	94	91	84	70	15	14
15	77	67	33	82	79	43	85	8	7
16	99	93	33	100	97	43	88	7	5
17	97	98	55	100	97	65	88	4	8
18	90	89	82	95	92	89	84	5	11
19	82	67	35	87	84	45	85	10	5
20	96	90	90	100	97	94	85	5	10
21	62	41	28	67	64	38	85	10	5
22	70	47	22	75	72	32	91	6	3
23	95	93	60	100	97	70	91	3	6
24	92	92	68	97	94	78	86	8	6
25	86	80	40	91	88	50	90	7	3
26	95	95	95	100	97	94	89	6	5
27	94	67	60	99	96	70	91	6	3
28	90	84	78	95	92	88	87	9	4
29	84	77	78	89	86	83	90	7	4
30	90	83	60	95	92	70	89	8	3

NOTE: AEO = American Community Survey (ACS) Eligibility Option; BRR = blended reimbursement rate.
SOURCE: Prepared by the panel.

	Illustrative, Post-AEO		BRR			
Free	Reduced Price	Full Price	Actual Pre-AEO ($)	Illustrative Post-AEO ($)	Difference ($)	Percentage Difference
80	9	11	2.36	2.29	−0.07	−3
64	11	25	1.97	1.96	0.00	0
75	10	15	2.26	2.20	−0.05	−2
62	17	21	2.06	2.03	−0.03	−1
77	9	14	2.27	2.22	−0.04	−2
61	21	18	2.12	2.09	−0.03	−1
78	11	11	2.36	2.29	−0.07	−3
69	9	22	2.03	2.05	0.02	1
65	14	21	2.07	2.05	−0.02	−1
84	8	8	2.49	2.38	−0.11	−4
84	7	10	2.41	2.34	−0.07	−3
80	6	15	2.25	2.22	−0.03	−1
85	7	8	2.41	2.37	−0.04	−2
70	15	15	2.20	2.18	−0.02	−1
83	9	8	2.39	2.36	−0.03	−1
87	7	6	2.44	2.41	−0.03	−1
87	4	9	2.39	2.36	−0.02	−1
84	5	12	2.31	2.30	−0.01	0
83	11	6	2.43	2.41	−0.03	−1
85	5	10	2.34	2.34	0.00	0
81	13	6	2.44	2.40	−0.04	−1
87	8	4	2.49	2.46	−0.03	−1
91	3	6	2.44	2.43	−0.01	−1
86	7	7	2.42	2.40	−0.01	0
90	7	3	2.50	2.48	−0.01	−1
90	6	5	2.45	2.46	0.01	0
89	7	3	2.50	2.48	−0.01	−1
87	9	4	2.46	2.46	−0.01	0
80	7	4	2.48	2.48	0.00	0
88	9	3	2.50	2.49	−0.01	0

TABLE 4-18 BRRs for Case Study Districts Based on Certified Students Versus Meals Served Under Traditional Operating Procedures and the AEO

District	Blended Reimbursement Rates			Difference from Certified Students BRR			
	Meals Served			Actual Meals Served, Pre-AEO		Illustrative Meals Served, Post-AEO	
	Certified Students ($)	Actual, Pre-AEO ($)	Illustrative, Post-AEO ($)	Difference ($)	Percentage Difference	Difference ($)	Percentage Difference
Austin, Texas	1.71	2.12	2.05	0.41	24	0.34	20
Chatham County, Georgia	1.80	2.01	1.96	0.21	11	0.15	9
Norfolk, Virginia	1.59	1.87	1.81	0.29	18	0.22	14
Omaha, Nebraska	1.64	1.84	1.80	0.20	12	0.16	10
Pajaro Valley, California	1.81	2.22	2.13	0.41	23	0.33	18

NOTE: AEO = American Community Survey (ACS) Eligibility Option; BRR = blended reimbursement rate.
SOURCE: Prepared by the panel.

districts, both 3- and 5-year estimates would likely be more accurate than 1-year estimates. However, whether the 3- or 5-year estimates would be more accurate is less clear. Although some results suggest that the 3-year estimates appear to strike the most effective compromise between precision and stability on the one hand and responsiveness to change on the other, the panel was unable to perform some analyses because the sets of estimates available to us were too limited.

- BRRs based on the distribution of certified students can be substantially less than BRRs based on the distribution of meals served, although changes in participation after adoption of the AEO could reduce these differences.

Based on the panel's empirical analyses, as well as consultations with experts and reviews of relevant documents, the panel reached the following conclusions:

Conclusion 4-1: A one-size-fits-all approach for benchmarking ACS estimates of students eligible for school meals to administrative estimates to minimize the differences caused by such factors as underreporting of SNAP participation is not possible at present. Further research will be required to determine whether a technically sound and operationally feasible set of procedures for estimating the necessary adjustments to the ACS estimates can be developed. Furthermore, even if such procedures were identified and used, additional adjustments based on a district's own data might improve the benchmarking of the ACS estimates to administrative estimates.

Conclusion 4-2: Medium districts generally should prefer the 5-year ACS estimates to the 3-year estimates, and large districts generally should prefer either the 3- or 5-year estimates to the 1-year estimates. However, it is not clear whether large districts should prefer the 3- or 5-year estimates.

Conclusion 4-3: Although all districts should thoroughly assess their estimates and the potential implications of adopting the AEO, as discussed in detail in Chapter 5, districts with enrollments below 400 should consider especially carefully whether reimbursements might fluctuate too much if they were based on ACS 5-year estimates.[40]

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[40]Many districts fall in this category—about 30 percent of the very high FRPL districts.

TABLE 4-19 BRRs for Case Study District Schools Based on Certified Students Versus Meals Served Under Traditional Operating Procedures and the AEO

School	BRR Certified Students ($)	BRR Meals Served Actual, Pre-AEO ($)	BRR Meals Served Illustrative, Post-AEO ($)
1	1.92	2.36	2.29
2	1.94	1.97	1.96
3	1.95	2.26	2.20
4	1.95	2.06	2.03
5	2.01	2.27	2.22
6	1.97	2.12	2.09
7	2.01	2.36	2.29
8	2.02	2.03	2.05
9	2.03	2.07	2.05
10	2.08	2.49	2.38
11	2.10	2.41	2.34
12	2.14	2.25	2.22
13	2.14	2.41	2.37
14	2.14	2.20	2.18
15	2.22	2.39	2.36
16	2.24	2.44	2.41
17	2.27	2.39	2.36
18	2.28	2.31	2.30
19	2.29	2.43	2.41
20	2.33	2.34	2.34
21	2.31	2.44	2.40
22	2.34	2.49	2.46
23	2.37	2.44	2.43
24	2.37	2.42	2.40
25	2.42	2.50	2.48
26	2.45	2.45	2.46
27	2.45	2.50	2.48
28	2.45	2.46	2.46
29	2.47	2.48	2.48
30	2.47	2.50	2.49

NOTE: AEO = American Community Survey (ACS) Eligibility Option; BRR = blended reimbursement rate.
SOURCE: Prepared by the panel.

Difference from Certified Students BRR			
Actual Meals Served, Pre-AEO		Illustrative Meals Served, Post-AEO	
Difference ($)	Percentage Difference	Difference ($)	Percentage Difference
0.44	23	0.37	19
0.03	1	0.03	1
0.31	16	0.25	13
0.11	6	0.08	4
0.26	13	0.22	11
0.15	8	0.12	6
0.35	17	0.28	14
0.02	1	0.03	2
0.04	2	0.02	1
0.41	20	0.30	15
0.31	15	0.24	11
0.11	5	0.09	4
0.27	13	0.24	11
0.06	3	0.04	2
0.18	8	0.14	6
0.20	9	0.17	8
0.12	5	0.10	4
0.02	1	0.02	1
0.14	6	0.11	5
0.01	1	0.01	1
0.13	6	0.09	4
0.15	7	0.12	5
0.07	3	0.06	2
0.05	2	0.04	1
0.07	3	0.06	3
0.00	0	0.01	0
0.04	2	0.03	1
0.02	1	0.01	0
0.01	0	0.01	0
0.03	1	0.02	1

Conclusion 4-4: To develop accurate claiming percentages for use in implementing the AEO, it will be necessary to estimate not only the distribution of eligible students across the free, reduced-price, and full-price categories but also their expected participation rates with all meals being served free of charge.

As documented in this chapter, the panel's analyses demonstrate that the ACS eligibility estimates, on average, are substantially and systematically different from administrative estimates for high and very high FRPL districts. For all but the smallest districts, however, reimbursements based on ACS estimates might be equally stable over time and often more so than reimbursements based on administrative estimates, and this feature of the AEO might be attractive to districts along with its other benefits. Although a one-size-fits-all approach for benchmarking ACS estimates to administrative estimates is not feasible at present, a tailored approach to using ACS estimates could possibly allow more districts to offer free meals to all students under the AEO. In the next chapter, we propose an approach that FNS might consider for implementing the AEO and that some districts might find attractive if they wished to adopt the AEO in all or some of their schools.

5

A Plan for Implementing the AEO

The panel was convened to investigate the technical and operational feasibility of using data from the American Community Survey (ACS) to expand the availability of free school meals under a new special provision of the National School Lunch Program (NSLP) and School Breakfast Program (SBP). Under an ACS Eligibility Option (AEO), the ACS would provide estimates for the development of claiming percentages for use by the U.S. Department of Agriculture (USDA) in reimbursing school districts for the federal government's share of the costs of providing free school meals to all enrolled students in participating schools. Expanding the availability of free meals would likely lead to increased participation by students, which in turn could well lead to such desired outcomes as improved nutrition, health, and school performance.

Another benefit of using the AEO would be sparing families and school districts the burden and costs of completing and processing annual application forms. In contrast, two existing special provisions, Provisions 2 and 3, require periodic administration of applications to provide the baseline for claiming percentages for the next 3-4 years (unless it can be demonstrated that economic conditions have not changed substantially). The Community Eligibility Option (CEO), which is currently being pilot-tested in districts in three states, requires less paperwork than Provisions 2 and 3, but it requires direct certification (determination of eligibility on the basis of matching to lists of participants in other programs for low-income families and children) at least every 4 years. The major disadvantage of the CEO is that it can be used only by districts or

schools with 40 percent or more of enrolled students who are identified as eligible for free meals through direct certification or the use of local lists of categorically eligible students. According to the form FNS-742 data set for 2009-2010, only 3.5 percent of school districts would be eligible to adopt the CEO districtwide, although it is more widely applicable for schools or groups of schools.

Because school districts must use nonfederal funds to make up any difference between their costs and the USDA reimbursement, Provisions 2 and 3, the CEO, and the AEO are likely to be most attractive to schools with high percentages of students eligible for free or reduced-price meals. Assuming for the sake of illustration that the AEO would appeal to school districts with 75 percent or more eligible students, then according to Table 3-1 in Chapter 3, the AEO might be attractive to as many as 1,291 districts.[1] These districts are a relatively small percentage (10 percent) of the total number of districts nationwide, yet they enroll a larger percentage of total students (13 percent). Table 5-1 shows that of the districts that reported operating under Provision 2 or 3, not in a base year, in the FNS-742 data set for 2009-2010, 296 (79 percent) had implemented the provision districtwide. Of these districts, 69 percent had 75 percent or more of students certified for free or reduced-price meals, while the others were almost evenly split between those with 50 to 75 percent of students eligible for free or reduced-price meals and those with 50 percent or fewer of students eligible. Although this evidence supports the statement that the AEO may appeal to districts with free or reduced-price eligibility percentages greater than 75 percent, it also shows that there must be reasons why districts with smaller percentages of free- and reduced-price-eligible students may choose to participate. The panel observes further that because many districts with less than 75 percent eligible students districtwide include some schools that exceed the 75 percent cutoff, still more students could benefit from a universal free meals program should these districts adopt the AEO for a subset of their schools.

The panel's original expectation regarding the AEO was based on the assumption that the U.S. Census Bureau would be able to estimate accurate ACS-based claiming percentages straightforwardly for every school district in the United States, and the Food and Nutrition Service (FNS) would allow districts to use the ACS-based estimates to claim reimbursements under a universal free meals option. With a universally applicable method providing accurate estimates, districts that wanted to adopt the AEO districtwide could proceed with confidence that the ACS estimates would be satisfactory. As with Provisions 2 and 3, districts could determine whether the benefits of implementation would outweigh the

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[1]Some of these districts are likely to be participating in Provision 2 or 3 already.

TABLE 5-1 Districts Operating Under Provision 2 or 3 in 2009-2010, Not in a Base Year

| | Percentage Free or Reduced Price | | | |
	Less Than or Equal to 50%	Greater Than 50%, Less Than or Equal to 75%	Greater Than 75%	Total
Districtwide				
Number	34	29	233	296
Percentage	11	10	79	
Some Schools				
Number	43	61	31	135
Percentage	32	45	23	
Total	77	90	264	431
Total Districts in United States				12,257
Percentage of Total Districts Under Provision 2 or 3				4

SOURCE: Prepared by the panel.

costs in their own situations. Should adoption of the AEO for a subset of schools be preferable to districtwide adoption, the district would have to complete an additional step of providing geographic boundaries for the applicable school attendance areas to the Census Bureau, which would prepare ACS estimates for those areas.

As demonstrated in the preceding chapter, however, ACS estimates are not sufficiently accurate for use in a one-size-fits-all version of the AEO. The remainder of this chapter briefly summarizes the reasons why the panel's initial goal of a universal method could not be achieved and then provides a detailed description of a tailored approach to implementing the AEO for consideration by FNS. In the subset of districts that decides to investigate the AEO and for which accurate claiming percentages can be developed, it might still be possible to achieve the AEO's advantages of providing universal free meals and eliminating applications. The panel's recommendations for research and development in Chapter 6 are directed toward improvements in data and estimation methods that would enhance prospects for using the AEO more widely in the future.

INITIAL GOAL VERSUS REALITY

The panel's initial goal was to identify a universally applicable method for estimating ACS-based claiming percentages and, if sufficient data on school district costs and increased participation under a universal free meals program could be obtained, to specify when it would be cost-beneficial for a school district to adopt the AEO for some or all of its schools. With regard to ACS-based claiming percentages, we anticipated that one or more simple adjustments might be needed to account for consistent differences between ACS eligibility estimates and administrative estimates derived from the application and certification processes conducted by districts.

As noted earlier, the data the panel collected and the extensive analyses we undertook did not enable us to recommend a universally applicable method for implementing the AEO for the school meals programs. This conclusion should not be taken as a general indictment of the ACS, which was not designed specifically to support the school meals programs but as a multipurpose survey covering a variety of subject areas. Moreover, the significant variations in school district characteristics, such as enrollment size, populations served, and organization (for example, open enrollment and charter schools) make it unlikely that any general-purpose survey could serve as the basis for a universally applicable new special provision. That being said, the quality of the ACS reporting of income and program participation could undoubtedly be improved, and our findings identify promising areas for research and development to that end (see Chapter 6).

Systematic Differences

The first, and most important, impediment to a universal, one-size-fits-all approach for the AEO is that in districts with more than 50 percent of students eligible for free or reduced-price meals, ACS direct estimates,[2] when compared with administrative estimates for all such school districts and for all the schools in the panel's five case study districts, generally understate the percentage of students eligible for free meals and overstate the percentages eligible for reduced-price and full-price meals. This pattern of differences is especially pronounced in districts and schools with very high percentages (75 percent or more) of students eligible for free and reduced-price meals, which are precisely those districts most likely to be interested in the AEO if accurate claiming percentages could be

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[2]For small districts, for which the gains in precision from model-based estimates are greatest, the systematic differences between model-based and administrative estimates are substantially larger than the systematic differences between direct and administrative estimates.

developed. Moreover, the differences between administrative and ACS estimates of students eligible for free and reduced-price meals likely vary substantially among school districts. Consequently, despite extensive investigation, we were unable to develop a set of universally applicable adjustments to ACS-based estimates of students eligible for free and reduced-price meals that would achieve reasonable consistency with administrative estimates from the current certification process. As described in Chapter 4, many factors appear to underlie the differences between the ACS estimates and administrative data (including errors in those data), and the importance of each factor varies among districts.

Sampling Variability

In addition to the systematic differences between ACS eligibility estimates and administrative data, the ACS estimates exhibit sampling variability, which could cause claiming percentages and reimbursements to fluctuate excessively from year to year. However, the panel found that while 1-year ACS estimates are more variable than the administrative estimates to which districts are accustomed, 3- and 5-year ACS estimates are less variable than administrative estimates for large districts. For typical medium-sized districts, the ACS 3-year estimates have about the same variability as administrative estimates, and the 5-year estimates have less variability. For small districts with enrollments of at least 400 students, the 5-year ACS estimates would be somewhat more stable than administrative estimates; for smaller districts, however, the ACS estimates might be less stable than administrative estimates.

Timeliness Bias and Overall Accuracy

The 5-year ACS estimates are less variable—that is, more stable—over time than the 1-year and 3-year ACS estimates. However, because the 5-year estimates average the most recent data with older data over a 5-year period, the 5-year estimates are less responsive to real changes in socioeconomic conditions, such as those occurring during the recent "Great Recession," than the 1- and 3-year estimates. Likewise, the 3-year estimates are more stable but less responsive to changes than the 1-year estimates.

School food authority directors who participated in the panel's workshop (refer back to Chapter 3) indicated that the stability of claiming percentages from year to year was generally more important than their timeliness. The reason is that dramatic changes in claiming percentages due to sampling variability or a rapid improvement in economic conditions (or both) would leave a school district scrambling for funds if a large drop in federal reimbursements occurred. (Of course, changes in claiming percentages that increased reimbursements would benefit the district.)

This concern leads to a preference for using ACS estimates based on more rather than fewer years of data even though the estimates would be less reflective of current economic conditions. This preference is reinforced by our finding that for medium-sized districts, 5-year estimates are likely to be more accurate than 3-year estimates when one takes into account error from both variability and timeliness bias. For large districts, both 3- and 5-year estimates are likely to be more accurate than 1-year estimates, although whether the 3- or 5-year estimates are more accurate is less clear. Based on these findings, we outline below how a school district might approach the stability-timeliness trade-off in evaluating the AEO.

Calculation of Costs and Benefits

Because of a lack of sufficient data, the panel was unable to develop universally applicable estimates of the expected additional costs due to offering free meals to all students versus the savings due to eliminating the application, certification, and verification processes and to economies in the meal-serving process (such as eliminating the need to count meals by eligibility category or to collect money). The data available to the panel suggest that the net costs would likely vary significantly among school districts.

Also because of a lack of data, the panel was unable to develop universally applicable estimates of the expected increase in participation among students in different eligibility categories (free, reduced-price, full-price) under a universal free meals program. Accurate estimates of participation by category are essential not only for estimating claiming percentages that accurately reflect changed participation patterns so the federal government appropriately reimburses school districts, but also for accurately calculating the net costs to school districts of implementing universal free meals. Our suggested approach for implementing the AEO accommodates the lack of data on changes in participation by using the same mechanism used for Provision 2—namely, using a base year during which all meals are served free, but applications are taken, verifications are conducted, and reimbursement is based on meal counts by category. The base-year participation rates will reflect any changes in participation due to providing free meals to all students, and they can be used in conjunction with ACS eligibility estimates for establishing claiming percentages.

Of course, a full cost-benefit calculation also needs to account for nonpecuniary benefits, such as an improved environment in the cafeteria due to elimination of stigma and improvements in diet quality that may ultimately lead to improvements in student health and school performance. There may also be nonpecuniary costs, such as possible dissatisfaction among some stakeholders because of perceived increased costs for

universal free meals. At the panel's workshop, some of the participants representing school districts indicated that they would probably consider only districtwide adoption of the AEO to reflect public opinion in their districts, while others would probably consider implementing the AEO only in some schools. All of these officials, however, emphasized that their district would need to "run the numbers" to determine whether the AEO was financially viable in terms of the district being able to cover the costs of the meals programs through federal reimbursements and other sources of funds while providing free meals to all students attending schools in which the AEO might be adopted.

OVERVIEW OF THE PROPOSED AEO

As noted above, the AEO proposed by the panel, like Provision 2, begins with a base year during which districts collect applications, conduct verifications, and count meals but feed all students free of charge. Reimbursement in the base year makes use of meal counts by category, as in the traditional approach. ACS eligibility estimates and the district's own administrative data for a minimum of 4 years (including the base year) are used to compute benchmarked ACS claiming percentages that are used to determine reimbursements in future years, when all meals are free. The benchmarked ACS claiming percentages are updated annually when the new ACS data become available.

The benchmarking approach proposed by the panel automatically adjusts for systematic differences between the ACS estimates and a district's administrative data. As discussed in Chapter 4, many of the reasons for these systematic differences relate to issues affecting the ACS estimates, particularly in high-poverty areas: underreporting of Supplemental Nutrition Assistance Program (SNAP, formerly the Food Stamp Program) benefits; use of annual rather than monthly income to determine eligibility; omission of students who live in group quarters or nontraditional housing; differential inclusion of part-time residents, such as migrant workers, who live in traditional housing; and school choice. Benchmarking is likely to remove these causes of systematic errors. Because it is based on certification data, however, benchmarking can perpetuate the effects of certification error. That is, if certification error is present in a district's administrative data, it will continue to be present in AEO benchmarked estimates. Furthermore, all else being equal, the AEO will be more attractive to districts with higher levels of overcertification.[3]

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[3]Further research could be undertaken to develop an approach for adjusting administrative estimates to remove certification error. Prior to approval of a district's request to adopt the AEO, FNS might want to review the district's verification results and consider corrections to the district's benchmarking adjustments for certification error.

This section provides an overview of the implementation of the AEO, beginning with the provision of ACS tabulations for school districts to use in deciding whether to adopt this new provision. The approach discussed here requires one or more interagency agreements between the Census Bureau, FNS, and possibly the National Center for Education Statistics (NCES) addressing schedules for activities, resources to be devoted to those activities, and other issues that ultimately will determine whether the panel's recommended methods and procedures are operationally feasible. FNS and states will need to provide technical assistance to school districts, including the AEO Calculator, a web-based tool or spreadsheet designed to perform all calculations proposed by the panel (described in further detail below).

The AEO, like other special provisions for the school meals programs, would be offered as an option for districts. It would not be imposed universally or on any particular district. Therefore, each district would have to make its own decision about whether to adopt the AEO. The decision a district makes and the effects of that decision will be independent of what other districts decide because the reimbursement of districts under the school meals programs is different from the allocation of funds under a program that has a fixed amount to allocate. In the latter case, one jurisdiction's gain is another's loss, whereas in the school meals programs, one district's reimbursement does not affect that of any other district. To determine whether to adopt the AEO, a district would weigh the benefits and costs of this new special provision in its own socioeconomic and political context.

For a school district to adopt the AEO, it must be confident that ACS-based claiming percentages will satisfy its own requirements for stability over time and for reimbursements large enough to cover costs when combined with other available funds. From a federal perspective, however, reimbursements should not be excessive; to control total program costs, amounts should be consistent with eligibility and participation as established by law. The requirement that reimbursements be sufficient but not excessive implies, above all, that the estimated claiming percentages must be reasonably accurate for a district or subset of schools adopting the AEO. As described in more detail below, it will be important for FNS to monitor the accuracy of ACS eligibility estimates, the accuracy of administrative certification estimates, and the accuracy and stability of differences between ACS and administrative estimates. If FNS detects substantial changes, the causes and implications of such changes will need to be investigated.

Derivation and Provision of ACS Estimates
at the School District Level

Under the proposed AEO, FNS will arrange with the Census Bureau to provide annually for each school district in the country ACS direct estimates and the associated standard errors for the percentage of students in each eligibility category—free, reduced-price, and full-price—prepared according to the panel's specifications (as updated based on further research). FNS should request that 1-year, 3-year, and 5-year school district-level estimates for all past ACS years, from 2005 through 2011, be made public in 2013, with new estimates being released annually thereafter. Clear lines of communication and authority must be established among FNS, states, local authorities, and the Census Bureau if this new approach is to work effectively. Moreover, there are financial implications, probably for FNS, of commissioning a new set of services from the Census Bureau.

The Census Bureau maintains up-to-date school district boundary information and already provides special tabulations of the ACS for school districts to NCES. The Census Bureau also provides estimates from its Small Area Income and Poverty Estimates (SAIPE) Program for all school districts included in its geographic database. Hence, it should be relatively straightforward for the Census Bureau to prepare estimates for school districts according to the panel's specifications.[4]

The AEO Calculator

The panel envisions that FNS will provide the AEO Calculator, a web-based tool for districts to use in analyzing the feasibility of the AEO, calculating benchmarked ACS eligibility percentages, and calculating claiming percentages for use under the AEO. The AEO Calculator will enable separate analyses for the NSLP and the SBP, although benchmarked eligibility rates will be the same for both programs. Claiming percentages will be computed using the same eligibility percentages but program-specific participation data. The AEO Calculator also will enable districts currently operating under Provision 2 or 3 to determine whether it would be advantageous for them to switch to the AEO. The AEO Calculator will make district-level ACS estimates available. Districts will need to enter their own certification and participation data, and the Calculator will guide them as to the data that are needed. Ideally, the Calculator will also be a useful tool for FNS and districts to use in communicating about

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[4]Optimally, NCES and FNS would coordinate their tabulation requests, and both agencies would use the panel's specifications for eligibility estimates for school meals.

the AEO. For example, a district might inform FNS through the Calculator that it was interested in participating in the AEO and provide FNS with all of the input and calculated output from the Calculator for approval and accountability purposes.

District Assessment of ACS Estimates

School districts will have to be comfortable with a decision to implement the AEO because once a community has become accustomed to a universal free meals program with no application requirements, it will be difficult to retreat from that decision—a point made by the district officials participating in the panel's workshop based on their experience with Provision 2. To minimize financial uncertainty, districts must be able to envision new operating systems and accurately estimate changes in operating costs and participation.[5] Many state and local financial systems do not appear to collect data at an appropriate level of detail to support the development of sound cost and savings estimates. Moreover, many districts appear to lack experience and expertise in large-scale systems change. These factors appear to make districts risk adverse and likely to persist in old ways of doing business. Since use of ACS estimates may be perceived as a more radical departure from the current application and certification processes than the existing special provisions, local hesitancy to adopt the AEO may be magnified. This possibility argues for outreach and technical assistance from the federal government. It also argues for a strong state agency role. Many districts reported to the panel that their state officials did not provide useful information or technical assistance regarding implementation of the existing special provisions. In some cases, states appeared to actively discourage their use. On the other hand, some states, such as Texas, have successfully promoted the use of special provisions and serve as a model in this regard.

A district considering whether to implement the AEO would compare the impact of using the AEO relative to the current method. To this end, the district would enter multiple years of its own administrative data into the AEO Calculator. The AEO Calculator would produce benchmarked estimates—that is, estimates adjusted to reflect local circumstances, such as a large migrant population or other systematic differences between the ACS data and local administrative data. The district would assess the relationship among district administrative data, the ACS eligibility estimates, and ACS benchmarked estimates and determine whether the

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[5]The panel found a paucity of consistent data on costs of administrative processes for school districts. Similarly, few data were available on the extent of changes in participation that result from providing free meals to all students.

ACS benchmarked estimates would satisfy its criteria for currency, accuracy, and temporal stability if used to establish claiming percentages for reimbursement.[6]

If a district decided that the ACS benchmarked estimates were insufficiently stable or too inaccurate, it might decide not to implement the AEO. If the district decided that the ACS benchmarked estimates appeared to be acceptable, it would apply to FNS or the state to initiate a base year for implementation of the AEO. After approval, the district could conduct a base year, providing free meals to all children but continuing to collect applications, conduct verifications, and count meals.[7] During the base year, as in Provision 2, participation should increase as a result of making meals free to all students. These increases in participation would be accounted for in the AEO claiming percentages, although during the base year, reimbursements would be based on the traditional approach. The district would enter base-year data on certification percentages and participation by eligibility group into the AEO Calculator, which would have been updated by FNS with the latest ACS eligibility estimates. Benchmarked eligibility percentages, blended reimbursement rates (BRRs), and claiming percentages would then be produced. The district would verify that the benchmarked ACS BRRs were sufficiently stable and within an acceptable range for operating a universal free meals program.

Should the district decide to go forward with the AEO, the benchmarking adjustments and participation rates derived during the base year would be used to produce updated benchmarked ACS eligibility estimates and claiming percentages in future years as new ACS data were released. After the initial base year, no additional base years would be required.

Derivation and Release of ACS Estimates for School Attendance Areas

Many districts have pockets of poverty within their borders. Thus an entire district may have less than 75 percent of students eligible for free or reduced-price meals, but selected schools within the district may have higher percentages of such students and may therefore be good candidates for a special provision whereby all meals are served free. The problem in this situation is that less than districtwide implementation limits

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[6]Districts should examine especially carefully the ACS estimates for 2010 and 2011 because they will reflect the effects of using the new ACS population controls based on the 2010 decennial census. If the calculated reimbursement rates for these years are substantially higher or lower than those for previous years, the district should consider waiting another year until 2012 ACS estimates are released, allowing the assessment of 3 years of reimbursement rates constructed from ACS estimates based on the new population controls.

[7]A district could conduct two base years if it did not yet have at least 3 years of consistent ACS and administrative data.

a district's ability to simplify operations and as a consequence lowers administrative savings, which is one of the sources of revenue for funding the cost of providing free meals to all students. Additionally, some districts reported to the panel that they would not consider implementing a free program less than districtwide since the community reaction would be negative. Because this situation may be fairly common, the panel suggests that FNS and state agencies provide special help and encouragement to those districts that have pockets of poverty within their boundaries as these districts face special implementation challenges.

One challenge associated with providing estimates for schools or groups of schools in districts that declined to adopt the AEO districtwide for financial or other reasons is that the Census Bureau does not maintain boundary information at this level of geographic detail. Hence, FNS would need to establish an annual process by which school districts that chose to implement the AEO only for some schools in the district would provide boundary information in the form of census blocks that make up a school attendance area or an attendance area for a group of schools. The district would provide this information to FNS, which would aggregate all such school district requests and provide them to the Census Bureau. In return, the Census Bureau would provide ACS estimates for these areas according to the panel's specifications. FNS would make these estimates available to the districts; the estimates would also be available from the Census Bureau to the public at large on request in accordance with the Bureau's policy for special tabulations.[8]

Many local planning offices maintain geographic boundaries for school catchment areas. By contacting the local planning office, a district might find it easy to obtain geographic boundaries or lists of census blocks for the groups of schools it proposed for the AEO. Where there was no active local planning office or the school food authority director was unfamiliar with the local planning office, districts might find obtaining appropriate geographic information daunting. It also is not yet clear whether there would be a cost to school districts for obtaining annual ACS estimates for groups of schools. If there were such a cost, it might discourage participation.

The Census Bureau has indicated that if school districts were to provide sufficiently accurate digitized school attendance area boundaries or lists of the census blocks associated with school attendance areas (or both), it would be able to provide special ACS tabulations of students eligible for free and reduced-price school meals for those areas. The estimates for school attendance areas for schools or groups of schools would be based on 1-year, 3-year, or 5-year ACS data, depending on the population size

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[8]See http://www.census.gov/population/www/cen2000/sptabs/faq.html#7.

of the attendance area for a school or group of schools. School-level detail is most likely to be available only from the 5-year ACS data. The Census Bureau expressed concern about the burden of preparing these tabulations should many districts decide to adopt this approach. Based on the tabulations presented in Table 5-2, however, only 101 districts with enrollments of more than 12,000 students (0.9 percent of all districts) fall in the heterogeneous low or medium need categories, and only 252 districts with fewer than 12,000 students (2 percent of all districts) fall in these categories.[9] Hence, only a minority—perhaps a small minority—of districts would likely be interested in the AEO at the subdistrict level. Table 5-1 presented earlier displays counts of districts that reported participating in Provision 2 or 3 (not in a base year) on form FNS-742 in 2009-2010. It shows counts separately for those districts operating under Provision 2 or 3 for all schools in the district versus only some schools. According to this table, only 4 percent of districts were implementing Provision 2 or 3 not in a base year in 2009-2010. Of these, 69 percent were implementing Provision 2 or 3 districtwide. Of the districts using Provision 2 or 3 districtwide, 79 percent were in the very high FRPL category, 10 percent were in the high FRPL category, and 11 percent were in the low to moderate FRPL category. Among districts implementing Provision 2 or 3 for some schools, 23 percent were in the very high FRPL category, 45 percent were in the high FRPL category, and 32 percent were in the low to moderate FRPL category.

A PROCEDURE FOR BENCHMARKING ACS ESTIMATES AND UPDATING CLAIMING PERCENTAGES DISTRICTWIDE

This section details the panel's proposed procedure for benchmarking ACS estimates and updating claiming percentages districtwide for purposes of implementing the AEO. After ACS estimates have been derived by the Census Bureau according to the procedures described above and released, a district that is potentially interested in districtwide adoption of the AEO can follow these steps:

1. Calculate preliminary benchmarked ACS eligibility estimates and BRRs.
2. Conduct a preliminary assessment of the use of benchmarked ACS estimates to implement the AEO.

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[9]In a heterogeneous district, a substantial percentage (at least 25 percent) of schools have at least 75 percent of students eligible for free or reduced-price meals. A substantial percentage (at least 25 percent) of its schools also have less than 50 percent of students eligible for free or reduced-price meals.

TABLE 5-2 Number and Percentage of School Districts in the United States in 2009-2010 by Need, Heterogeneity of Need, and Enrollment Size

| Enrollment Size | Need: School District Percentage Approved for Free or Reduced-Price Meals | | | | | |
| | Low (< 50%) | | Medium (50 to 75%) | | High (≥ 75%) | |
	Homogeneous Schools	Heterogeneous Schools	Homogeneous Schools	Heterogeneous Schools	Homogeneous Schools	Heterogeneous Schools
≥ 25K	125 (1.0%)	8 (0.1%)	59 (0.5%)	47 (0.4%)	41 (0.3%)	0 (0.0%)
12 to 25K	204 (1.6%)	12 (0.1%)	115 (0.9%)	34 (0.3%)	52 (0.4%)	0 (0.0%)
< 12K	7,107 (54.9%)	72 (0.6%)	3,684 (28.5%)	180 (1.4%)	1,177 (9.1%)	21 (0.2%)

SOURCE: Prepared by the panel.

3. Conduct an AEO base year (with necessary approvals).
4. Update the benchmarked ACS eligibility estimates and BRRs.
5. Conduct a final assessment of the use of benchmarked ACS estimates to implement the AEO.
6. Make a decision about adopting the AEO, and obtain necessary approvals.
7. Update claiming rates for ongoing operation of the AEO.

All of the calculations required to complete these steps will be performed by the AEO Calculator.

The following subsections describe these steps in detail. The next section describes variations on these procedures to reflect special circumstances, including the steps that can be followed by a district that either is considering adopting the AEO in only some schools within the district or is already operating under Provision 2 or 3. Also discussed is further refinement a district can consider to account specifically for students who do not live in traditional housing and are not included in the ACS estimates based on the household population.

Step 1: Calculate Preliminary Benchmarked
ACS Eligibility Estimates and BRRs

The first step for a district that is interested in the AEO is to use the AEO Calculator to obtain preliminary benchmarked ACS estimates and BRRs based on those estimates. For purposes of this discussion, we assume that it is early 2013, just after the Census Bureau has provided 2011, 2009-2011, and 2007-2011 ACS estimates of students eligible for the school meals programs to FNS. At that time, small districts (with populations under 20,000) will have three 5-year estimates available (2005-2009, 2006-2010, and 2007-2011); medium districts (with populations of 20,000 to 65,000) will also have five 3-year estimates available (2005-2007, 2006-2008, 2007-2009, 2008-2010, and 2009-2011); and large districts (with populations above 65,000) will also have seven 1-year estimates available for each year from 2005 through 2011. All of these ACS estimates will have been preloaded into the AEO Calculator by FNS. In response to prompts from the Calculator, the district will input its administrative data on total enrollment and the numbers of students certified for free and for reduced-price meals for each year from 2005 through 2011, or at least their data for 2009, 2010, and 2011.[10]

The AEO Calculator will benchmark the ACS estimates to the district's administrative estimates, using the differences between average admin-

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[10]The preliminary benchmarking adjustments require at least 3 years of data.

istrative certification percentages and average ACS eligibility percentages as benchmarking adjustments.[11] These calculations are illustrated in Box 5-1. Each set of estimates that is available for a district will be benchmarked. The calculations for benchmarking 5-year estimates are shown in Box 5-2. The AEO Calculator will perform similar computations for benchmarking 3- and 1-year estimates. For large districts, benchmarked 1-, 3-, and 5-year estimates will be produced. For small districts, there will be only benchmarked 5-year estimates. The AEO Calculator will also provide BRRs based on the benchmarked ACS estimates, as illustrated in Box 5-3. The benchmarked ACS eligibility estimates and BRRs derived in this step are preliminary. Final values will be calculated in a later step when additional estimates are available.

Step 2: Conduct a Preliminary Assessment of the Use of Benchmarked ACS Estimates to Implement the AEO

The second step for a district is to examine the BRRs calculated in Step 1 to determine whether they are sufficiently stable from year to year and within an acceptable range for operating the school meals programs. The district will also be able to compare estimates from the AEO Calculator of the total reimbursements it would have received based on the benchmarked ACS estimates and the reimbursements it actually received, as well as compare the BRRs based on benchmarked ACS estimates with those based on the district's administrative data on certified students. While small districts will examine the benchmarked 5-year estimates in their assessment, medium districts will also be able to consider the benchmarked 3-year estimates, and large districts will be able to consider not only benchmarked 5-year and 3-year estimates but also benchmarked 1-year estimates. If a large district determines that the BRRs based on 1-year estimates fluctuate too much from year to year, it may find that the BRRs based on 3- or 5-year estimates are sufficiently stable. A district should keep in mind that its participation rates will likely increase—although differentially across categories—and the total meals served will increase if it offers free meals to all students (see Step 3 below, which entails conducting an AEO base year to observe participation effects).[12]

When conducting its preliminary assessment, a district should examine especially carefully the 1-year estimates for 2010 and 2011 (if it is a large

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[11]We propose an additive benchmarking adjustment because that is consistent with the additive nature of the ACS multiyear estimates and the model used in Chapter 4 to derive empirical results on precision, temporal stability, and responsiveness to change.

[12]Allowing a district to input alternative participation rates to assess the effects on BRRs and total reimbursements would likely be a useful capability of the AEO Calculator.

BOX 5-1
Calculating ACS and Administrative Averages
and Benchmarking Adjustments

Step 1a: Calculate averages of ACS estimates

$\bar{S}_{Ek}^{f}$ = the average percentage of students eligible for free meals, and
$\bar{S}_{Ek}^{r}$ = the average percentage of students eligible for reduced-price meals,

where k = 1, 3, or 5, indicating whether the average pertains to 1-, 3-, or 5-year ACS estimates.

Step 1b: Calculate averages of administrative estimates

$\bar{S}_{Ck}^{f}$ = the average percentage of students certified for free meals, and
$\bar{S}_{Ck}^{r}$ = the average percentage of students certified for reduced-price meals,

where k indicates whether the average will be used for comparison with ACS 1-, 3-, or 5-year estimates.

For comparison with ACS 5-year estimates for 2005-2009, 2006-2010, and 2007-2011, the AEO Calculator will average across administrative estimates for October 2009, October 2010, and October 2011. For comparison with ACS 3-year estimates for 2005-2007, 2006-2008, 2007-2009, 2008-2010, and 2009-2011, the Calculator will average across administrative estimates for October 2007, October 2008, October 2009, October 2010, and October 2011.

Step 1c: Calculate preliminary benchmarking adjustments (illustrated for 5-year estimates)

$B_{5}^{f} = \bar{S}_{C5}^{f} - \bar{S}_{E5}^{f}$ = benchmarking adjustment for 5-year estimates of percentage of students eligible for free meals, and
$B_{5}^{r} = \bar{S}_{C5}^{r} - \bar{S}_{E5}^{r}$ = benchmarking adjustment for 5-year estimates of percentage of students eligible for reduced-price meals.

SOURCE: Prepared by the panel.

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district), the 3-year estimates for 2008-2010 and 2009-2011 (if it is a large or medium district), and the 5-year estimates for 2006-2010 and 2007-2011. These estimates will reflect the effects of using the new ACS population controls based on the 2010 decennial census. If the BRRs based on these estimates are substantially higher or lower than the BRRs based on estimates for prior years (2005, 2006, 2007, 2008, and 2009 for 1-year estimates; 2005-2007, 2006-2008, and 2007-2009 for 3-year estimates; and 2005-2009 for

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BOX 5-2
Preliminary Benchmarking of ACS Estimates

Step 1d: Calculate preliminary benchmarked ACS eligibility percentages (illustrated for 5-year estimates)

$S_{E509}^{fB} = S_{E509}^{f} + B_5^{f}$ = benchmarked 2005-2009 estimate of the percentage of students eligible for free meals,

$S_{E510}^{fB} = S_{E510}^{f} + B_5^{f}$ = benchmarked 2006-2010 estimate of the percentage of students eligible for free meals,

$S_{E511}^{fB} = S_{E511}^{f} + B_5^{f}$ = benchmarked 2007-2011 estimate of the percentage of students eligible for free meals,

$S_{E509}^{rB} = S_{E509}^{r} + B_5^{r}$ = benchmarked 2005-2009 estimate of the percentage of students eligible for reduced-price meals,

$S_{E510}^{rB} = S_{E510}^{r} + B_5^{r}$ = benchmarked 2006-2010 estimate of the percentage of students eligible for reduced-price meals, and

$S_{E511}^{rB} = S_{E511}^{r} + B_5^{r}$ = benchmarked 2007-2011 estimate of the percentage of students eligible for reduced-price meals.

SOURCE: Prepared by the panel.

5-year estimates), the district should consider waiting another year until the 2012, 2010-2012, and 2008-2012 ACS estimates are released, allowing the assessment of BRRs constructed from benchmarked ACS estimates based on the new population controls for 3 years.[13]

If a district concludes from its assessment that it would be financially viable to operate under the AEO using benchmarked ACS estimates and that BRRs are likely to be sufficiently stable, it should proceed to the next step. If the BRRs fall outside an acceptable range or are excessively variable, the district can either cease its consideration of the AEO or conduct further research to determine, for example, whether a different adjustment method would improve the estimates.

Step 3: Conduct an AEO Base Year

If a district remains interested in the AEO after its assessment of preliminary estimates, it should conduct an AEO base year (after receiving any necessary approvals). During the base year, as under Provision 2, the

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[13]If a district does not want to wait for another year of ACS estimates, an alternative is to conduct 2 base years instead of 1; see Step 3 below.

BOX 5-3
Calculating Preliminary Blended Reimbursement
Rates Based on Benchmarked ACS Estimates and
a District's Most Recent Participation Rates

Step 1e: Calculate preliminary BRRs (illustrated with 5-year estimates)

$$BRR_{E509} = \frac{R^f_{0910}S^{fB}_{E509}D^f + R^r_{0910}S^{rB}_{E509}D^r + R^p_{0910}\left(100 - S^{fB}_{E509} - S^{rB}_{E509}\right)D^p}{S^{fB}_{E509}D^f + S^{rB}_{E509}D^r + \left(100 - S^{fB}_{E509} - S^{rB}_{E509}\right)D^p}$$

= BRR based on the benchmarked 2005-2009 ACS estimates,

$$BRR_{E510} = \frac{R^f_{1011}S^{fB}_{E510}D^f + R^r_{1011}S^{rB}_{E510}D^r + R^p_{1011}\left(100 - S^{fB}_{E510} - S^{rB}_{E510}\right)D^p}{S^{fB}_{E510}D^f + S^{rB}_{E510}D^r + \left(100 - S^{fB}_{E510} - S^{rB}_{E510}\right)D^p}$$

= BRR based on the benchmarked 2006-2010 ACS estimates, and

$$BRR_{E511} = \frac{R^f_{1112}S^{fB}_{E511}D^f + R^r_{1112}S^{rB}_{E511}D^r + R^p_{1112}\left(100 - S^{fB}_{E511} - S^{rB}_{E511}\right)D^p}{S^{fB}_{E511}D^f + S^{rB}_{E511}D^r + \left(100 - S^{fB}_{E511} - S^{rB}_{E511}\right)D^p}$$

= BRR based on the benchmarked 2007-2011 ACS estimates,

where R^f, R^r, and R^p are the district's per meal reimbursement rates for free, reduced-price, and full-price meals, respectively (with subscripts referencing school years), and D^f, D^r, and D^p, respectively, are the district's most recent free, reduced-price, and full-price October participation rates (average daily meals served in category divided by certified students in category).

SOURCE: Prepared by the panel.

district will conduct its traditional application, verification, certification, and meal counting procedures but offer free meals to all students. The district should track the costs of the traditional procedures that will be eliminated under the AEO. It should also monitor changes in the total number of meals served and record the number of meals served to students in each eligibility category during October of the base year.[14] These figures

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[14]If the student enrollment in a district fluctuates seasonally with, for example, the movement of families of migrant workers, the district may be able to use average administrative estimates of certified students and meals served for the entire school year, rather than figures just for October, in the calculations performed to benchmark ACS estimates and derive claiming percentages.

will be used by the AEO Calculator to compute participation rates that capture the effects on participation of offering free meals to all students.[15]

Step 4: Update the Benchmarked ACS Eligibility Estimates and BRRs

During the AEO base year, new 1-year, 3-year, and 5-year ACS estimates will be released. If the base year is conducted during school year 2013-2014, these ACS estimates will be for 2012, 2010-2012, and 2008-2012. In this step, the district will input base-year administrative data on enrollment, counts of certified students by category, and participation (average daily meals served) by category, and the AEO Calculator will update the benchmarked estimates from Step 1 to include the new ACS and administrative estimates. The benchmarking adjustments calculated in this step by the Calculator will be the final adjustments, and if the district adopts the AEO, they will be used for ongoing operation under the AEO. The AEO Calculator will also compute updated BRRs using each set of benchmarked ACS estimates and the district's participation rates for October of the AEO base year.

Step 5: Conduct a Final Assessment of the Use of Benchmarked ACS Estimates to Implement the AEO

In Step 5, a district will perform an assessment that is similar to the preliminary assessment conducted in Step 2. It will examine the BRRs from Step 4 to determine whether they are within a financially acceptable range and sufficiently stable from year to year. In comparing the BRRs with its historical experience, the district should keep in mind that the BRRs reflect the participation rates of the AEO base year, when free meals were provided to all students. Furthermore, it is important to examine not only the average reimbursement rates per meal (the BRRs) but also the total reimbursements for all meals served, as estimated by the AEO Calculator. The district should also consider in its assessment how the total number of meals served has been affected by offering free meals to all students and the effect of any change in this total on, for example, the cost structure of its food service operations. Medium districts should compare the temporal stability and financial acceptability of the BRRs based on 3- and 5-year estimates, weighing the generally greater stability associated with 5-year estimates against the generally greater responsiveness to socioeconomic change associated with the 3-year estimates. Large districts

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[15]A district with a very high FRPL percentage and a BRR close to the reimbursement rate for free meals could be given the option of skipping the AEO base year if it already had at least four sets of ACS estimates to use for establishing a benchmarking adjustment.

should include in their comparison the BRRs based on 1-year estimates, which are generally the least stable but the most responsive to change.

Step 6: Make a Decision About Adopting the AEO and Obtain Necessary Approvals

Based on its assessment in Step 5, a district will decide whether to adopt the AEO. If it wishes to adopt the AEO, it will be able to obtain claiming rates from the AEO Calculator. A large district will have to determine whether it wishes to base its claiming rates on benchmarked 1-, 3-, or 5-year estimates, while a medium district will have to choose between benchmarked 3- and 5-year estimates as the basis for its claiming rates. As shown in Box 5-4, the initial set of claiming rates will be based on the most recent release of ACS estimates (assumed to be the 2012, 2010-2012, or 2008-2012 estimates) and participation data from the base year. To obtain approval for adopting the AEO, the district will have to comply with any regulations or other requirements imposed by FNS and state and local authorities.

BOX 5-4
Calculating AEO Claiming Rates for Use in First Year After Base Year

Step 6: Calculate initial claiming rates

If a district chooses to base its claiming rates on the benchmarked k-year estimates, where k = 1, 3, or 5, the initial claiming rates are

- $C^f = \dfrac{S_{Ek12}^{fB} D^{f^*}}{S_{Ek12}^{fB} D^{f^*} + S_{Ek12}^{rB} D^{r^*} + \left(100 - S_{Ek12}^{fB} - S_{Ek12}^{rB}\right) D^{p^*}}$,

- $C^r = \dfrac{S_{Ek12}^{rB} D^{r^*}}{S_{Ek12}^{fB} D^{f^*} + S_{Ek12}^{rB} D^{r^*} + \left(100 - S_{Ek12}^{fB} - S_{Ek12}^{rB}\right) D^{p^*}}$, and

- $C^p = 1 - C^f - C^r$,

where D^{f^*}, D^{r^*}, and D^{p^*}, respectively, are the free, reduced-price, and full-price participation rates from the AEO base year, and S_{Ek12}^{fB} and S_{Ek12}^{rB} are the benchmarked k-year eligibility percentages (k = 1, 3, or 5) from the most recent release of ACS estimates.

SOURCE: Prepared by the panel.

Step 7: Update Claiming Rates for Ongoing Operation of the AEO

If a district's request for approval to adopt the AEO is granted, the district will be able to use the AEO Calculator to benchmark each newly released set of ACS eligibility percentages, as illustrated in Box 5-5. These benchmarked estimates will be used by the AEO Calculator along with participation rates from the AEO base year to compute updated claiming rates, as shown in Box 5-6. Both the base-year participation rates and the final benchmarking adjustments will be used indefinitely unless the district returns to the use of traditional operating procedures or another special provision on a permanent basis (that is, it drops the AEO) or conducts a new AEO base year. The district should continuously assess whether the AEO is meeting the district's objectives. If it is not, the district will be able to return to traditional operating procedures or adopt another special provision at any time, subject to whatever conditions are specified by FNS or state or local authorities.

Examples of Calculations for Case Study Districts

The panel's recommended procedure is illustrated here with calculations for the case study districts. For these illustrative calculations, we use the ACS 1-year estimates because enough sets of 3- and 5-year estimates

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BOX 5-5
Benchmarking Future ACS Eligibility Estimates

Step 7a: Benchmark each new set of ACS estimates

If the district is using the k-year estimates to establish claiming rates, the benchmarked eligibility percentages are

$$S_{EkTT}^{fB} = S_{EkTT}^{f} + B_{k,Final}^{f},$$

$$S_{EkTT}^{rB} = S_{EkTT}^{r} + B_{k,Final}^{r}, \text{ and}$$

$$S_{EkTT}^{pB} = 1 - S_{EkTT}^{fB} - S_{EkTT}^{rB},$$

where TT is the last year in the reference period for the k-year estimates; e.g., TT = 13 for the 5-year estimates for 2009-2013. $B_{k,Final}^{f}$ and $B_{k,Final}^{r}$ are the final benchmarking adjustments calculated (in Step 4) after the AEO base year.

SOURCE: Prepared by the panel.

BOX 5-6
Updating AEO Claiming Rates

Step 7b: Update AEO claiming rates

- $C^f = \dfrac{S_{EkTT}^{fB}D^{f^*}}{S_{EkTT}^{fB}D^{f^*} + S_{EkTT}^{rB}D^{r^*} + \left(100 - S_{EkTT}^{fB} - S_{EkTT}^{rB}\right)D^{p^*}}$,

- $C^r = \dfrac{S_{EkTT}^{rB}D^{r^*}}{S_{EkTT}^{fB}D^{f^*} + S_{EkTT}^{rB}D^{r^*} + \left(100 - S_{EkTT}^{fB} - S_{EkTT}^{rB}\right)D^{p^*}}$, and

- $C^p = 1 - C^f - C^r$,

where D^{f^*}, D^{r^*}, and D^{p^*}, respectively, are the free, reduced-price, and full-price participation rates from the AEO base year.

SOURCE: Prepared by the panel.

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are not yet available. As shown in Chapter 4, even the districts for which 1-year estimates are available may prefer to use the 3- or 5-year estimates, which will generally be more stable from year to year. Therefore, conclusions about the performance of the ACS estimates should not be drawn on the basis of these purely illustrative examples.

For the sake of illustration, we assume that the districts are beginning to consider the AEO in early 2009, just after the release of the ACS 1-year estimates for 2007, the third set of estimates after the previous release of estimates for 2005 and 2006. Tables 5-3, 5-4, 5-5, and 5-6 illustrate the calculation of the average of ACS eligibility percentages, the average of district certification percentages, the preliminary ACS benchmarking adjustments, and the preliminary benchmarked ACS eligibility percentages. When the ACS estimates for 2007 are released, the most recent October participation estimates that are available are for October 2008. These estimates are used in Table 5-7 to illustrate the calculation of preliminary BRRs, which concludes the computations performed under Step 1.

Tables 5-8, 5-9, and 5-10 illustrate the calculations necessary for the district to conduct an initial assessment of the AEO under Step 2 of the panel's proposed procedure. Table 5-8 illustrates the calculation of simulated reimbursements under the AEO, using the preliminary BRRs and counts of total meals served in October of each year. These BRRs are based on the benchmarked ACS eligibility estimates. Table 5-9 displays the calculation of the BRRs that would be associated with using the district's

TABLE 5-3 Step 1a: Calculate Averages of ACS Eligibility Percentages for Preliminary Benchmarking

District	1-Year ACS Estimate (%)			Average (%)
	2005	2006	2007	
Percentage Eligible for Free Meals				
Austin, Texas	35	40	42	39
Chatham County, Georgia	34	42	37	37
Norfolk, Virginia	45	47	44	46
Omaha, Nebraska	40	43	35	39
Pajaro Valley, California	36	28	35	33
Percentage Eligible for Reduced-Price Meals				
Austin, Texas	10	11	11	11
Chatham County, Georgia	17	16	18	17
Norfolk, Virginia	14	17	11	14
Omaha, Nebraska	10	10	11	10
Pajaro Valley, California	12	15	19	15

NOTE: ACS = American Community Survey.
SOURCE: Prepared by the panel.

TABLE 5-4 Step 1b: Calculate Averages of Administrative Certification Percentages for Preliminary Benchmarking

District	Administrative Estimate (%)			Average (%)
	2005	2006	2007	
Percentage Certified for Free Meals				
Austin, Texas	52	52	54	53
Chatham County, Georgia	49	52	57	53
Norfolk, Virginia	48	46	47	47
Omaha, Nebraska	49	57	50	52
Pajaro Valley, California	58	56	55	56
Percentage Certified for Reduced-Price Meals				
Austin, Texas	9	8	8	9
Chatham County, Georgia	8	9	9	9
Norfolk, Virginia	11	11	11	11
Omaha, Nebraska	9	11	11	10
Pajaro Valley, California	5	7	9	7

NOTE: For Pajaro Valley, the panel was unable to obtain administrative data for 2005 (the 2005-2006 school year) so estimates for that year are based on data from the Common Core of Data (CCD).
SOURCE: Prepared by the panel.

TABLE 5-5 Step 1c: Calculate Preliminary Benchmarking Adjustments

District	Administrative Average (%)	ACS Average (%)	Preliminary Benchmarking Adjustment (%)
Percentage Certified/Eligible for Free Meals			
Austin, Texas	53	39	14
Chatham County, Georgia	53	37	16
Norfolk, Virginia	47	46	2
Omaha, Nebraska	52	39	13
Pajaro Valley, California	56	33	24
Percentage Certified/Eligible for Reduced-Price Meals			
Austin, Texas	9	11	−2
Chatham County, Georgia	9	17	−8
Norfolk, Virginia	11	14	−3
Omaha, Nebraska	10	10	0
Pajaro Valley, California	7	15	−8

NOTE: ACS = American Community Survey.
SOURCE: Prepared by the panel.

TABLE 5-6 Step 1d: Calculate Preliminary Benchmarked Eligibility Percentages

District	Unbenchmarked 1-Year ACS Estimate (%)			Preliminary Benchmarking Adjustment (%)	Preliminary Benchmarked Eligibility Percentage (%)		
	2005	2006	2007		2005	2006	2007
Percentage Eligible for Free Meals							
Austin, Texas	35	40	42	14	49	54	55
Chatham County, Georgia	34	42	37	16	49	57	52
Norfolk, Virginia	45	47	44	2	47	49	46
Omaha, Nebraska	40	43	35	13	53	56	48
Pajaro Valley, California	36	28	35	24	60	51	58
Percentage Eligible for Reduced-Price Meals							
Austin, Texas	10	11	11	−2	8	9	9
Chatham County, Georgia	17	16	18	−8	9	8	10
Norfolk, Virginia	14	17	11	−3	11	14	8
Omaha, Nebraska	10	10	11	0	10	10	11
Pajaro Valley, California	12	15	19	−8	4	6	10

NOTE: ACS = American Community Survey.
SOURCE: Prepared by the panel.

TABLE 5-7 Step 1e: Calculate Preliminary BRRs

Year	Preliminary Benchmarked Eligibility Percentage (%)		Reimbursement Rate ($)			Participation Rate (October 2008) (%)			Preliminary BRR ($)
	Free	Reduced Price	Free	Reduced Price	Full Price	Free	Reduced Price	Full Price	
Austin, Texas									
2005	49	8	2.34	1.94	0.24				1.81
2006	54	9	2.42	2.02	0.25	86	72	34	1.96
2007	55	9	2.49	2.09	0.25				2.04
Chatham County, Georgia									
2005	49	9	2.34	1.94	0.24				1.64
2006	57	8	2.42	2.02	0.25	75	72	48	1.83
2007	52	10	2.49	2.09	0.25				1.82
Norfolk, Virginia									
2005	47	11	2.34	1.94	0.24				1.67
2006	49	14	2.42	2.02	0.25	77	71	43	1.80
2007	46	8	2.49	2.09	0.25				1.71
Omaha, Nebraska									
2005	53	10	2.34	1.94	0.24				1.69
2006	56	10	2.42	2.02	0.25	92	84	61	1.81
2007	48	11	2.49	2.09	0.25				1.72
Pajara Valley, California									
2005	60	4	2.34	1.94	0.24				1.97
2006	51	6	2.42	2.02	0.25	68	52	23	1.94
2007	58	10	2.49	2.09	0.25				2.13

NOTE: It is assumed that in each year, each district qualified for the additional reimbursement of $0.02 per meal for having served at least 60 percent of meals free or reduced price 2 years earlier. BRR = blended reimbursement rate.

SOURCE: Prepared by the panel.

TABLE 5-8 Step 2: Preliminary Assessment of the AEO: Simulate Reimbursements

Year	Preliminary BRR ($)	Total Meals Served in October (actual)	Total Reimbursement in October (simulated) ($)
Austin, Texas			
2005	1.81	1,007,694	1,821,797
2006	1.96	1,079,986	2,120,538
2007	2.04	1,126,100	2,297,991
Chatham County, Georgia			
2005	1.64	425,905	697,231
2006	1.83	454,688	833,189
2007	1.82	473,806	863,216
Norfolk, Virginia			
2005	1.67	506,815	847,832
2006	1.80	502,823	907,084
2007	1.71	487,791	835,760
Omaha, Nebraska			
2005	1.69	656,550	1,112,018
2006	1.81	708,455	1,285,027
2007	1.72	751,362	1,291,091
Pajara Valley, California			
2005	1.97	181,763	358,929
2006	1.94	188,053	365,591
2007	2.13	212,526	453,627

NOTES: For Pajaro Valley, the panel was unable to obtain data on meals served for 2005 (the 2005-2006 school year). Therefore, the estimate for 2005 is based on averaging estimates for 2004 and 2006. AEO = American Community Survey (ACS) Eligibility Option; BRR = blended reimbursement rate.
SOURCE: Prepared by the panel.

administrative certification percentages instead of the benchmarked ACS eligibility estimates. The BRRs from Tables 5-8 and 5-9 are compared in Table 5-10 and can be used to assess the stability of the reimbursements over time.

It is assumed that these districts decide to continue with the next step and conduct a base year under the AEO. The districts conduct their AEO base years in school year 2009-2010. During that year, the 1-year ACS estimates for 2008 become available and are used in calculating final benchmarking adjustments and conducting a final assessment of the AEO. Tables 5-11 through 5-14 show how the calculations necessary for benchmarking are updated to include the most recent year of data. Tables 5-11 and 5-12 illustrate the derivation of average ACS eligi-

TABLE 5-9 Step 2: Preliminary Assessment of the AEO: Calculate BRRs Based on Administrative Certification Percentages

Year	Administrative Certification Percentage (%)		Reimbursement Rate ($)			Participation Rate (October 2008) (%)			BRR ($)
	Free	Reduced Price	Free	Reduced Price	Full Price	Free	Reduced Price	Full Price	
Austin, Texas									
2005	52	9	2.34	1.94	0.24				1.87
2006	52	8	2.42	2.02	0.25	86	72	34	1.94
2007	54	8	2.49	2.09	0.25				2.01
Chatham County, Georgia									
2005	49	8	2.34	1.94	0.24				1.64
2006	52	9	2.42	2.02	0.25	75	72	48	1.76
2007	57	9	2.49	2.09	0.25				1.90
Norfolk, Virginia									
2005	48	11	2.34	1.94	0.24				1.68
2006	46	11	2.42	2.02	0.25	77	71	43	1.73
2007	47	11	2.49	2.09	0.25				1.79
Omaha, Nebraska									
2005	49	9	2.34	1.94	0.24				1.61
2006	57	11	2.42	2.02	0.25	92	84	61	1.85
2007	50	11	2.49	2.09	0.25				1.77
Pajaro Valley, California									
2005	58	5	2.34	1.94	0.24				1.97
2006	56	7	2.42	2.02	0.25	68	52	23	2.01
2007	55	9	2.49	2.09	0.25				2.08

NOTES: For Pajaro Valley, the panel was unable to obtain administrative data for 2005 (the 2005-2006 school year), so certification percentages for that year are based on data from the Common Core of Data (CCD). Also, it is assumed that in each year, each district qualified for the additional reimbursement of $0.02 per meal for having served at least 60 percent of meals free or reduced price 2 years earlier. AEO = American Community Survey (ACS) Eligibility Option; BRR = blended reimbursement rate.
SOURCE: Prepared by the panel.

TABLE 5-10 Step 2: Preliminary Assessment of the AEO: Compare BRRs Based on Benchmarked ACS Estimates with BRRs Based on Administrative Estimates

Year	BRRs Based on Benchmarked ACS Estimates ($)	BRRs Based on Administrative Estimates ($)	Difference ($)	Percentage Difference (%)
Austin, Texas				
2005	1.81	1.87	−0.06	−3
2006	1.96	1.94	0.03	1
2007	2.04	2.01	0.03	2
Chatham County, Georgia				
2005	1.64	1.64	0.00	0
2006	1.83	1.76	0.07	4
2007	1.82	1.90	−0.08	−4
Norfolk, Virginia				
2005	1.67	1.68	−0.01	−1
2006	1.80	1.73	0.08	5
2007	1.71	1.79	−0.08	−4
Omaha, Nebraska				
2005	1.69	1.61	0.08	5
2006	1.81	1.85	−0.03	−2
2007	1.72	1.77	−0.05	−3
Pajara Valley, California				
2005	1.97	1.97	0.01	0
2006	1.94	2.01	−0.07	−3
2007	2.13	2.08	0.06	3

NOTE: ACS = American Community Survey; AEO = ACS Eligibility Option; BRR = blended reimbursement rate.
SOURCE: Prepared by the panel.

bility percentages and average administrative certification percentages. Table 5-13 displays the calculation of the final benchmarking adjustments, and Table 5-14 shows the calculation of benchmarked eligibility percentages for 2005 through 2008. For evaluating the updated benchmarked estimates, Table 5-15 presents the calculation of BRRs based on the benchmarked eligibility percentages and the districts' participation rates during the base year, which reflect the effects on participation of offering free meals to all students. Of course, the panel has not actually observed these participation effects, and therefore, we must assume what they might have been. Our assumption is that participation rates among students otherwise eligible for free, reduced-price, and full-price meals increase

TABLE 5-11 Step 4a: Calculate Averages of ACS Eligibility Percentages for Final Benchmarking

District	1-Year ACS Estimate (%)				Average (%)
	2005	2006	2007	2008	
Percentage Eligible for Free Meals					
Austin, Texas	35	40	42	38	39
Chatham County, Georgia	34	42	37	34	36
Norfolk, Virginia	45	47	44	50	47
Omaha, Nebraska	40	43	35	43	40
Pajaro Valley, California	36	28	35	37	34
Percentage Eligible for Reduced-Price Meals					
Austin, Texas	10	11	11	10	11
Chatham County, Georgia	17	16	18	12	16
Norfolk, Virginia	14	17	11	13	14
Omaha, Nebraska	10	10	11	12	11
Pajaro Valley, California	12	15	19	18	16

NOTE: ACS = American Community Survey.
SOURCE: Prepared by the panel.

TABLE 5-12 Step 4b: Calculate Averages of Administrative Certification Percentages for Final Benchmarking

District	Administrative Estimate (%)				Average (%)
	2005	2006	2007	2008	
Percentage Certified for Free Meals					
Austin, Texas	52	52	54	56	53
Chatham County, Georgia	49	52	57	59	54
Norfolk, Virginia	48	46	47	48	47
Omaha, Nebraska	49	57	50	50	52
Pajaro Valley, California	58	56	55	59	57
Percentage Certified for Reduced-Price Meals					
Austin, Texas	9	8	8	8	8
Chatham County, Georgia	8	9	9	9	9
Norfolk, Virginia	11	11	11	11	11
Omaha, Nebraska	9	11	11	11	10
Pajaro Valley, California	5	7	9	9	7

NOTE: For Pajaro Valley, the panel was unable to obtain administrative data for 2005 (the 2005-2006 school year) so estimates for that year are based on data from the Common Core of Data (CCD).
SOURCE: Prepared by the panel.

TABLE 5-13 Step 4c: Calculate Final Benchmarking Adjustments

District	Administrative Average (%)	ACS Average (%)	Benchmarking Adjustment (%)
Percentage Certified/Eligible for Free Meals			
Austin, Texas	53	39	15
Chatham County, Georgia	54	36	18
Norfolk, Virginia	47	47	1
Omaha, Nebraska	52	40	11
Pajaro Valley, California	57	34	23
Percentage Certified/Eligible for Reduced-Price Meals			
Austin, Texas	8	11	−2
Chatham County, Georgia	9	16	−7
Norfolk, Virginia	11	14	−3
Omaha, Nebraska	10	11	0
Pajaro Valley, California	7	16	−9

NOTE: ACS = American Community Survey.
SOURCE: Prepared by the panel.

by 5, 7, and 10 percentage points, respectively, relative to the rates for the prior year (2008-2009), when the districts were operating under traditional procedures.[16]

To facilitate districts' final assessment of the AEO, Table 5-16 presents the total reimbursements that would be provided under the AEO based on the estimated BRRs and assumed increases in the total number of meals served (due to the offer of free meals to all students). Table 5-17 provides BRRs based on administrative certification percentages, and Table 5-18 compares the BRRs based on the benchmarked ACS estimates with the BRRs based on the administrative estimates. We assume for the sake of illustration that the districts evaluate this information and decide to adopt the AEO. Then, as shown in Table 5-19, claiming percentages are calculated. These percentages are used to determine reimbursements under the AEO during the first year following the base year.

In each subsequent year, new ACS estimates are released and can be used to update the districts' AEO claiming percentages. Table 5-20 shows how benchmarked ACS estimates for 2009 are calculated. Table 5-21 illustrates how the new benchmarked ACS estimates are used with the participation rates from the AEO base year to obtain updated claiming percentages.

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[16]Although the panel might have wanted to apply these assumed increases to the rates that were actually observed in 2009-2010, administrative data on meals served by the case study districts during that year were not available to us.

TABLE 5-14 Step 4d: Calculate Benchmarked Eligibility Percentages

District	Unbenchmarked 1-Year ACS Estimate (%)				Benchmarking Adjustment (%)	Benchmarked Eligibility Percentage (%)			
	2005	2006	2007	2008		2005	2006	2007	2008
Percentage Eligible for Free Meals									
Austin, Texas	35	40	42	38	15	50	55	56	53
Chatham County, Georgia	34	42	37	34	18	52	60	55	52
Norfolk, Virginia	45	47	44	50	1	46	48	45	51
Omaha, Nebraska	40	43	35	43	11	51	54	47	54
Pajaro Valley, California	36	28	35	37	23	60	51	58	60
Percentage Eligible for Reduced-Price Meals									
Austin, Texas	10	11	11	10	−2	7	9	9	8
Chatham County, Georgia	17	16	18	12	−7	10	9	11	5
Norfolk, Virginia	14	17	11	13	−3	11	14	8	10
Omaha, Nebraska	10	10	11	12	0	10	10	10	12
Pajaro Valley, California	12	15	19	18	−9	3	6	10	9

NOTE: ACS = American Community Survey.
SOURCE: Prepared by the panel.

TABLE 5-15 Step 4e: Calculate BRRs

Year	Benchmarked Eligibility Percentage (%)		Reimbursement Rate ($)			Assumed Base-Year Participation Rate (with free meals for all) (%)			BRR ($)
	Free	Reduced Price	Free	Reduced Price	Full Price	Free	Reduced Price	Full Price	
Austin, Texas									
2005	50	7	2.34	1.94	0.24				1.75
2006	55	9	2.42	2.02	0.25	91	79	44	1.91
2007	56	9	2.49	2.09	0.25				1.99
2008	53	8	2.59	2.19	0.26				2.00
Chatham County, Georgia									
2005	52	10	2.34	1.94	0.24				1.65
2006	60	9	2.42	2.02	0.25	80	79	58	1.85
2007	55	11	2.49	2.09	0.25				1.83
2008	52	5	2.59	2.19	0.26				1.74
Norfolk, Virginia									
2005	46	11	2.34	1.94	0.24				1.60
2006	48	14	2.42	2.02	0.25	82	78	53	1.73
2007	45	8	2.49	2.09	0.25				1.63
2008	51	10	2.59	2.19	0.26				1.85
Omaha, Nebraska									
2005	51	10	2.34	1.94	0.24				1.62
2006	54	10	2.42	2.02	0.25	97	91	71	1.74
2007	47	10	2.49	2.09	0.25				1.64
2008	54	12	2.59	2.19	0.26				1.90
Pajaro Valley, California									
2005	60	3	2.34	1.94	0.24				1.88
2006	51	6	2.42	2.02	0.25	73	59	33	1.83
2007	58	10	2.49	2.09	0.25				2.04
2008	60	9	2.59	2.19	0.26				2.16

NOTES: It is assumed that in each year, each district qualified for the additional reimbursement of $0.02 per meal for having served at least 60 percent of meals free or reduced-price 2 years earlier. Also, it is assumed that offering free meals to all students during the American Community Survey (ACS) Eligibility Option (AEO) base year will increase participation rates among students otherwise eligible for free, reduced-price, and full-price meals by 5, 7, and 10 percentage points, respectively, relative to the participation rates during the prior year, when the meals programs were operated under traditional procedures. The actual participation effects of free meals for all students could be substantially different. BRR = blended reimbursement rate.
SOURCE: Prepared by the panel.

TABLE 5-16 Step 5: Final Assessment of the AEO: Simulate Reimbursements

Year	BRR ($)	Total Meals Served in October (simulated)	Total Reimbursement in October (simulated) ($)
Austin, Texas			
2005	1.75	1,039,289	$1,813,969
2006	1.91	1,218,713	2,325,666
2007	1.99	1,306,676	2,594,775
2008	2.00	1,285,461	2,566,296
Chatham County, Georgia			
2005	1.65	470,642	775,083
2006	1.85	508,795	938,984
2007	1.83	548,438	1,006,208
2008	1.74	517,731	901,720
Norfolk, Virginia			
2005	1.60	512,977	819,495
2006	1.73	547,106	947,629
2007	1.63	514,439	837,414
2008	1.85	530,040	981,970
Omaha, Nebraska			
2005	1.62	774,990	1,257,158
2006	1.74	803,735	1,400,777
2007	1.64	830,806	1,361,501
2008	1.90	885,620	1,681,162
Pajara Valley, California			
2005	1.88	234,119	439,247
2006	1.83	228,119	416,916
2007	2.04	258,285	527,601
2008	2.16	252,468	544,635

NOTE: The estimates of total meals served include the effects on participation of offering free meals to all students. AEO = American Community Survey (ACS) Eligibility Option; BRR = blended reimbursement rate.
SOURCE: Prepared by the panel.

TABLE 5-17 Step 5: Final Assessment of the AEO: Calculate BRRs Based on Administrative Certification Percentages

Year	Administrative Certification Percentage (%)		Reimbursement Rate ($)			Assumed Base-Year Participation Rate (with free meals for all) (%)			BRR ($)
	Free	Reduced Price	Free	Reduced Price	Full Price	Free	Reduced Price	Full Price	
Austin, Texas									
2005	52	9	2.34	1.94	0.24				1.79
2006	52	8	2.42	2.02	0.25	91	79	44	1.86
2007	54	8	2.49	2.09	0.25				1.94
2008	56	8	2.59	2.19	0.26				2.05
Chatham County, Georgia									
2005	49	8	2.34	1.94	0.24				1.58
2006	52	9	2.42	2.02	0.25	80	79	58	1.70
2007	57	9	2.49	2.09	0.25				1.84
2008	59	9	2.59	2.19	0.26				1.96
Norfolk, Virginia									
2005	48	11	2.34	1.94	0.24				1.62
2006	46	11	2.42	2.02	0.25	82	78	53	1.66
2007	47	11	2.49	2.09	0.25				1.72
2008	48	11	2.59	2.19	0.26				1.81
Omaha, Nebraska									
2005	49	9	2.34	1.94	0.24				1.57
2006	57	11	2.42	2.02	0.25	97	91	71	1.81
2007	50	11	2.49	2.09	0.25				1.73
2008	50	11	2.59	2.19	0.26				1.80
Pajaro Valley, California									
2005	58	5	2.34	1.94	0.24				1.87
2006	56	7	2.42	2.02	0.25	73	59	33	1.92
2007	55	9	2.49	2.09	0.25				1.98
2008	59	9	2.59	2.19	0.26				2.13

NOTES: For Pajaro Valley, the panel was unable to obtain administrative data for the 2005-2006 school year, so certification percentages for that year are from the Common Core of Data (CCD). Also, it is assumed that in each year, each district qualified for the additional reimbursement of $0.02 per meal for having served at least 60 percent of meals free or reduced price 2 years earlier. In addition, it is assumed that offering free meals to all students during the AEO base year will increase participation rates among students otherwise eligible for free, reduced-price, and full-price meals by 5, 7, and 10 percentage points, respectively, relative to the participation rates during the prior year, when the meals programs were operated under traditional procedures. The actual participation effects of offering free meals to all students could be substantially different from what is assumed for one of these districts or any other particular district. AEO = American Community Survey (ACS) Eligibility Option; BRR = blended reimbursement rate.
SOURCE: Prepared by the panel.

TABLE 5-18 Step 5: Final Assessment of the AEO: Compare BRRs Based on Benchmarked ACS Estimates with BRRs Based on Administrative Estimates

Year	BRR Based on Benchmarked ACS Estimates ($)	BRR Based on Administrative Estimates ($)	Difference ($)	Percentage Difference (%)
Austin, Texas				
2005	1.75	1.79	−0.05	−3
2006	1.91	1.86	0.04	2
2007	1.99	1.94	0.05	3
2008	2.00	2.05	−0.05	−2
Chatham County, Georgia				
2005	1.65	1.58	0.07	4
2006	1.85	1.70	0.14	8
2007	1.83	1.84	−0.01	−1
2008	1.74	1.96	−0.22	−11
Norfolk, Virginia				
2005	1.60	1.62	−0.02	−1
2006	1.73	1.66	0.07	4
2007	1.63	1.72	−0.10	−6
2008	1.85	1.81	0.05	3
Omaha, Nebraska				
2005	1.62	1.57	0.06	4
2006	1.74	1.81	−0.06	−4
2007	1.64	1.73	−0.09	−5
2008	1.90	1.80	0.10	6
Pajaro Valley, California				
2005	1.88	1.87	0.00	0
2006	1.83	1.92	−0.09	−5
2007	2.04	1.98	0.06	3
2008	2.16	2.13	0.02	1

NOTE: AEO = American Community Survey (ACS) Eligibility Option; BRR = blended reimbursement rate.
SOURCE: Prepared by the panel.

TABLE 5-19 Step 6: Calculate Initial Claiming Percentages and Make Final Decision About Adopting the AEO

District	Benchmarked Eligibility Percentage (2008) (%)		(Assumed) Base-Year Participation Rate (%)			Initial Claiming Percentage (%)		
	Free	Reduced Price	Free	Reduced Price	Full Price	Free	Reduced Price	Full Price
Austin, Texas	53	8	91	79	44	67	9	24
Chatham County, Georgia	52	5	80	79	58	59	6	35
Norfolk, Virginia	51	10	82	78	53	59	11	30
Omaha, Nebraska	54	12	97	91	71	60	12	28
Pajaro Valley, California	60	9	73	59	33	74	9	17

NOTES: It is assumed that offering free meals to all students during the American Community Survey (ACS) Eligibility Option (AEO) base year will increase participation rates among students otherwise eligible for free, reduced-price, and full-price meals by 5, 7, and 10 percentage points, respectively, relative to the participation rates during the prior year, when the meals programs were operated under traditional procedures. The actual participation effects of offering free meals to all students could be substantially different from what is assumed for one of these districts or any other particular district.
SOURCE: Prepared by the panel.

TABLE 5-20 Step 7a: Benchmark Newly Released ACS Eligibility Percentages

District	Unbenchmarked 1-Year ACS Estimate (2009) (%)		Benchmarking Adjustment (%)		Benchmarked Eligibility Percentage (2009) (%)	
	Free	Reduced Price	Free	Reduced Price	Free	Reduced Price
Austin, Texas	49	10	15	–2	63	8
Chatham County, Georgia	39	14	18	–7	57	7
Norfolk, Virginia	44	7	1	–3	45	4
Omaha, Nebraska	46	11	11	0	58	11
Pajaro Valley, California	37	14	23	–9	60	5

NOTE: ACS = American Community Survey.
SOURCE: Prepared by the panel.

TABLE 5-21 Step 7b: Update AEO Claiming Percentages

District	Benchmarked Eligibility Percentage (2009) (%)		(Assumed) Base-Year Participation Rate (%)			Updated Claiming Percentage (%)		
	Free	Reduced Price	Free	Reduced Price	Full Price	Free	Reduced Price	Full Price
Austin, Texas	63	8	91	79	44	75	8	16
Chatham County, Georgia	57	7	80	79	58	63	8	29
Norfolk, Virginia	45	4	82	78	53	55	5	41
Omaha, Nebraska	58	11	97	91	71	63	11	25
Pajaro Valley, California	60	5	73	59	33	75	5	19

NOTES: It is assumed that offering free meals to all students during the American Community Survey (ACS) Eligibility Option (AEO) base year will increase participation rates among students otherwise eligible for free, reduced-price, and full-price meals by 5, 7, and 10 percentage points, respectively, relative to the participation rates during the prior year, when the meals programs were operated under traditional procedures. The actual participation effects of offering free meals to all students could be substantially different from what is assumed for one of these districts or any other particular district.
SOURCE: Prepared by the panel.

IMPLEMENTATION OF THE AEO UNDER
SPECIAL CIRCUMSTANCES

This section addresses implementation of the AEO in a group of schools within a district and by a district or group of schools already operating under Provision 2 or 3. It also describes adjustments made to benchmarked ACS estimates to reflect large numbers of special populations not well captured in the ACS, such as the homeless or migrants living in labor camps.

Implementing the AEO for a Group of Schools Within a District

If a district does not want to implement the AEO in all of its schools for financial or other reasons, it can assess the benefits and costs of implementation in a group of schools within the district. The following steps can be carried out by a district that is potentially interested in the AEO for a group of its schools:

1. Conduct a preliminary assessment of the use of benchmarked ACS estimates to implement the AEO for the entire district.
2. Identify the group of schools in which the AEO might be implemented.
3. Obtain ACS estimates for that group of schools.
4. Follow the seven steps for assessing and implementing the AEO for an entire district, treating the group of schools as if it were a district.

Step 1: Conduct a Preliminary Assessment of the Use of Benchmarked ACS Estimates to Implement the AEO for the Entire District

Although ACS estimates for the entire district will be readily available, obtaining estimates for individual schools or a group of schools will involve more substantial effort. Therefore, the panel suggests that the district begin its empirical assessment of the AEO by using the ACS estimates that are readily available and carrying out the first two steps in the procedure for districtwide adoption of the AEO, as described earlier in this chapter. If financial considerations are causing the district to explore the adoption of the AEO in only a group of its schools, the BRRs that are calculated for the entire district will likely appear too low and should not deter the district from continuing its assessment of the AEO. Instead, the district's preliminary assessment should focus on determining whether the BRRs based on benchmarked ACS estimates for the entire district are sufficiently stable. If so, the district should proceed to the next step. If not, the BRRs pertaining to only a group of schools may exhibit

too much volatility from year to year. In that case, the district may not want to devote further resources to consideration of the AEO. On the other hand, the BRRs for a homogenous group of schools may be more stable than the BRRs for the more heterogeneous collection of schools that constitutes the entire district.

Step 2: Identify the Group of Schools in Which the AEO Might Be Implemented

Several nonfinancial and nonstatistical considerations, including the typography of the district and local politics, will potentially influence which schools are selected for this group. An important financial consideration is that the group of schools as a whole should have a high percentage of students certified to receive free or reduced-price meals—on the order of, perhaps, 75 percent. A statistical consideration is that the group of schools should have sufficiently high aggregate enrollment to make it likely that ACS estimates for the group will remain stable from year to year. Based on results presented in Chapter 4, a general rule of thumb is that the schools in the group should have a combined enrollment of at least 400. The district's selection of schools will be determined by such financial and statistical considerations and any other considerations it regards as important.

Step 3: Obtain ACS Estimates for That Group of Schools

Districts will need to develop attendance boundary information for their selected group of schools. This information may be in the form of a list of census blocks that make up the attendance areas for the schools, as well as school-specific information on grade structure. In some situations, boundary information may be readily available from a local planning office. Districts will need to provide this information in their request to FNS. FNS will collect all such requests and submit them to the Census Bureau once a year. The timing of the process will be determined by FNS in consultation with the Census Bureau. ACS estimates for the selected geographic areas containing the group of schools will be provided by the Census Bureau from at least the four most recent ACS data releases.

Step 4: Follow the Seven Steps for Assessing and Implementing the AEO for an Entire District, Treating the Group of Schools as If It Were a District

The district will next need to follow each of the seven steps outlined in the previous section, but treat the group of schools it has selected as if it were a district.

Implementing the AEO in Provision 2 and 3 Districts

The AEO is likely to be of greatest interest to districts that are already operating under Provision 2 or 3. However, these districts will not have available the data needed to use the methodology described above, even though they may well be the districts that would benefit most from the AEO. This section describes how these districts could shift to the AEO without conducting a new base year. However, the panel recognizes that this approach locks in place estimates that are of unknown quality, and there are policy issues to be considered in deciding whether to implement the approach.

The calculations specified in this section assume that the only data available for districts that are currently operating under Provision 2 or 3 are the claiming percentages developed during the base year—that is, there are no administrative data on the distribution of students across categories. An implication of this assumption is that participation rates cannot be calculated. An alternative approach, similar to the approach described above for all districts, is possible if the Provision 2 or 3 base-year data on certification percentages, total enrollment, and counts of meals served are also available. With these additional data, it is possible to calculate participation rates. The advantage of this alternative approach is that the district would have benchmarked eligibility percentages from the ACS in addition to claiming percentages. The benchmarked eligibility percentages could be used to satisfy the data needs of other programs, as discussed below.

For districts currently operating under Provision 2 or 3, no AEO base year would be required. Hence, there would be no return to the taking of applications or other traditional operating procedures during the transition from Provision 2 or 3 to the AEO, although a district could do so if it wished. A district operating under Provision 2 or 3 would need to wait until at least four sets of ACS estimates were available.[17] If Provision 2 or 3 had been implemented for a group of schools, the district would need to obtain boundary information for those schools and submit the request for ACS estimates to FNS.[18] The four steps for implementing the AEO in a Provision 2 or 3 district (or group of schools) are described below.

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[17]For small districts, the fourth set of 5-year estimates (for 2008-2012) will be available in early 2014. For medium and large districts, there are already at least four sets of 3- and 1-year estimates.

[18]It may be feasible for the AEO to be implemented in a group of schools that is not identical to the group operating under Provision 2 or 3. The panel, however, has not addressed those details.

Step 1: Calculate Benchmarked ACS Estimates

For Provision 2 or 3 districts, the initial calculations in the benchmarking process are shown in Box 5-7. However, because these estimates are based on 4 years of ACS data, and there is no base year, the benchmarking adjustments are the final adjustments that will be used annually to update ACS estimates for use as claiming rates under the AEO.

The benchmarking adjustments are different only in that they are based on the differences between the Provision 2 or 3 claiming percentages (rather than average certification percentages) and average ACS eligibility percentages. The benchmarking adjustments for a small district are shown in Box 5-7. For a medium district, the AEO Calculator will produce two additional benchmarking adjustments: one for the 3-year estimates of the percentage of students eligible for free meals and one for the 3-year estimates of the percentage of students eligible for reduced-price

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BOX 5-7
Calculating ACS and Administrative Averages and
Benchmarking Adjustments
Provision 2 or 3 Districts

Step 1a: Calculate averages of ACS estimates

$\bar{S}_{Ek}^{f}$ = the average percentage of students eligible for free meals, and
$\bar{S}_{Ek}^{r}$ = the average percentage of students eligible for reduced-price meals,

where k = 1, 3, or 5, indicating whether the average pertains to 1-, 3-, or 5-year ACS estimates.

Step 1b: Calculate benchmarking adjustments (illustrated for 5-year estimates)

For a small district, there are two benchmarking adjustments:

$B_{5}^{f} = 100 * C_{p2/3}^{f} - \text{Ave } S_{E5}^{f}$ = benchmarking adjustment for 5-year estimates of percentage of students eligible for free meals, and

$B_{5}^{r} = 100 * C_{p2/3}^{r} - \text{Ave } S_{E5}^{r}$ = benchmarking adjustment for 5-year estimates of percentage of students eligible for reduced-price meals,

where $C_{p2/3}^{f}$ and $C_{p2/3}^{r}$ are the claiming rates for free and reduced-price meals, respectively, under Provision 2 or 3.

SOURCE: Prepared by the panel.

meals. For a large district, the AEO Calculator will produce two more benchmarking adjustments, which correspond to the 1-year estimates.

The benchmarked ACS estimates shown in Box 5-8 reflect adjusted claiming percentages rather than eligibility percentages. For a small district, the AEO Calculator will produce eight such benchmarked estimates. The same approach will be used for benchmarking 3- and 1-year ACS estimates for medium and large districts.

Box 5-9 illustrates the calculation of the BRRs based on the benchmarked ACS estimates for the past 4 years for a small district. In addition to the BRRs based on the benchmarked 5-year ACS estimates, a medium district will examine six BRRs based on the benchmarked 3-year estimates, and a large district will also examine eight BRRs based on the benchmarked 1-year estimates.

BOX 5-8
Benchmarking of ACS Estimates
Provision 2 or 3 Districts

Step 1d: Calculate benchmarked ACS claiming percentages (illustrated for 5-year estimates)

$S_{C509}^{fB} = S_{E509}^{f} + B_{5}^{f}$ = benchmarked 2005-2009 estimate of the claiming percentage for free meals,

$S_{C510}^{fB} = S_{E510}^{f} + B_{5}^{f}$ = benchmarked 2006-2010 estimate of the claiming percentage for free meals,

$S_{C511}^{fB} = S_{E511}^{f} + B_{5}^{f}$ = benchmarked 2007-2011 estimate of the claiming percentage for free meals,

$S_{C512}^{fB} = S_{E512}^{f} + B_{5}^{f}$ = benchmarked 2008-2012 estimate of the claiming percentage for free meals,

$S_{C509}^{rB} = S_{E509}^{r} + B_{5}^{r}$ = benchmarked 2005-2009 estimate of the claiming percentage for reduced-price meals,

$S_{C510}^{rB} = S_{E510}^{r} + B_{5}^{r}$ = benchmarked 2006-2010 estimate of the claiming percentage for reduced-price meals,

$S_{C511}^{rB} = S_{E511}^{r} + B_{5}^{r}$ = benchmarked 2007-2011 estimate of the claiming percentage for reduced-price meals, and

$S_{C512}^{rB} = S_{E512}^{r} + B_{5}^{r}$ = benchmarked 2008-2012 estimate of the claiming percentage for reduced-price meals.

SOURCE: Prepared by the panel.

BOX 5-9
Calculating Blended Reimbursement Rates
Based on Benchmarked ACS Claiming
Percentages in Provision 2 or 3 Districts

Step 1d: Calculate BRRs (illustrated with 5-year estimates)

$BRR_{C509} = [R_{0910}{}^f (S_{C509}{}^{fB} / 100) + R_{0910}{}^r (S_{C509}{}^{rB} / 100) + R_{0910}{}^p ((100 - S_{C509}{}^{fB} - S_{C509}{}^{rB}) / 100)] = BRR$ based on the benchmarked 2005-2009 ACS claiming percentage,

$BRR_{C510} = [R_{1011}{}^f (S_{C510}{}^{fB} / 100) + R_{1011}{}^r (S_{C510}{}^{rB} / 100) + R_{1011}{}^p ((100 - S_{C510}{}^{fB} - S_{C510}{}^{rB}) / 100)] = BRR$ based on the benchmarked 2006-2010 ACS claiming percentage,

$BRR_{C511} = [R_{1112}{}^f (S_{C511}{}^{fB} / 100) + R_{1112}{}^r (S_{C511}{}^{rB} / 100) + R_{1112}{}^p ((100 - S_{C511}{}^{fB} - S_{C511}{}^{rB}) / 100)] = BRR$ based on the benchmarked 2007-2011 ACS claiming percentage, and

$BRR_{C512} = [R_{1213}{}^f (S_{C512}{}^{fB} / 100) + R_{1213}{}^r (S_{C512}{}^{rB} / 100) + R_{1213}{}^p ((100 - S_{C512}{}^{fB} - S_{C512}{}^{rB}) / 100)] = BRR$ based on the benchmarked 2008-2012 ACS claiming percentage,

where R^f, R^r, and R^p, respectively, are the district's per meal reimbursement rates for free, reduced-price and full-price meals (with subscripts referencing school years).

SOURCE: Prepared by the panel.

Step 2: Conduct an Assessment of the Use of Benchmarked ACS Estimates to Implement the AEO

The district will examine the BRRs calculated in Step 1 to determine whether they are sufficiently stable from year to year and within an acceptable range for operating the school meals programs. For this assessment, the AEO Calculator can multiply each BRR, which gives the average reimbursement per meal, by a recent monthly or annual figure for the total number of meals served to estimate the total reimbursement the district would have received based on the benchmarked ACS estimates. The district can also compare the BRRs based on benchmarked ACS estimates with BRRs based on the district's claiming percentages under Provision 2 or 3, derived by the AEO Calculator using the BRR formulas in Box 5-9—the benchmarked ACS claiming percentages being replaced

by the Provision 2 or 3 claiming percentages. While small districts will examine the benchmarked 5-year estimates in their assessment, medium districts can also consider the benchmarked 3-year estimates, weighing the generally greater stability associated with 5-year estimates against the generally greater responsiveness to socioeconomic change associated with the 3-year estimates. Large districts can consider benchmarked 5- and 3-year estimates, as well as benchmarked 1-year estimates, which are generally the least stable but the most responsive to change. If a large district determines that the BRRs based on 1-year estimates fluctuate too much from year to year, it may find that the BRRs based on 3- or 5-year estimates are sufficiently stable.

When conducting its assessment, a district should examine especially carefully the 1-year estimates for 2010, 2011, and 2012; the 3-year estimates for 2008-2010, 2009-2011, and 2010-2012; and the 5-year estimates for 2006-2010, 2007-2011, and 2008-2012. These estimates will reflect the effects of using the new ACS population controls based on the 2010 decennial census. If the BRRs based on these estimates are substantially higher or lower than BRRs based on previous estimates, the district should consider waiting another year until the 2013, 2011-2013, and 2009-2013 ACS estimates are released, allowing the assessment of four BRRs constructed from benchmarked ACS estimates based on the new population controls.

Step 3: Make a Decision About Adopting the AEO and Obtain Necessary Approvals

Based on its assessment in Step 2, a district will decide whether to adopt the AEO. If a district concludes from its assessment that it will be financially viable to operate under the AEO using benchmarked ACS estimates and that BRRs are likely to be sufficiently stable, the district may want to adopt the AEO. If the BRRs fall outside an acceptable range or are excessively variable, the district can cease its consideration of the AEO or conduct further research to determine, for example, whether a different adjustment method would improve the estimates.

A large district will have to determine whether it wishes to base its claiming rates on benchmarked 1-, 3-, or 5-year estimates, while a medium district will have to choose between benchmarked 3- and 5-year estimates as the basis for its claiming rates. If a district chooses to base its claiming rates on the k-year estimates, where k = 1, 3, or 5, its AEO claiming rates based on 2012 data will be calculated as shown in Box 5-10. These are the claiming rates that will be used during school year 2014-2015.

To obtain approval for adopting the AEO, the district will have to comply with any regulations or other requirements imposed by FNS and state and local authorities.

BOX 5-10
Calculation of AEO Claiming Rates for Use in 2014-2015
Provision 2 or 3 Districts

$$C_{AEO}^{f} = \left(S_{Ck12}^{fB} / 100\right),$$

$$C_{AEO}^{r} = \left(S_{Ck12}^{rB} / 100\right), \text{ and}$$

$$C_{AEO}^{p} = 1 - C_{AEO}^{f} - C_{AEO}^{r},$$

where S_{Ck12}^{fB} and S_{Ck12}^{rB} are the benchmarked k-year estimates (k = 1, 3, or 5) from the most recent release of ACS estimates (assumed for this example to be the 2012, 2010-2012, or 2008-2012 estimates).

SOURCE: Prepared by the panel.

Step 4: Update Claiming Rates for Ongoing Operation of the AEO

If a district's request for approval to adopt the AEO is granted, the district will update its claiming rates each year based on the most recently released ACS estimates as shown in Box 5-11. The benchmarking adjustments will be used indefinitely as long as the district operates under the AEO. The district will continuously assess whether the AEO is meeting the district's objectives. If it is not, the district can return to traditional operating procedures or Provision 2 or 3 at any time, subject to whatever conditions are specified by FNS or state or local authorities.

Adjusting for Students Living in Nontraditional Housing[19]

As discussed in Chapter 4, one reason for discrepancies between ACS and administrative estimates is that the ACS estimates for school districts exclude students who do not live in traditional housing. However, homeless students and students living in migrant labor camps, for example, are likely known to school districts (which receive lists of such students), and they are categorically eligible for free meals. A school district that has a substantial number of such students and has data for at least 3 years should consider an adjustment to its ACS estimates.

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[19]To adjust for seasonal fluctuations in the student population associated, for example, with the movement of migrant workers, districts can replace their October certification estimates with averages based on the entire school year.

BOX 5-11
Benchmarking Future ACS Estimates and
Updating of AEO Claiming Rates
Provision 2 or 3 Districts

Assume that the district is using the k-year ACS estimates to establish claiming rates. Then the benchmarked ACS claiming percentages are

$$S_{CkTT}^{fB} = S_{EkTT}^{f} + B_{k}^{f}, \text{ and}$$
$$S_{CkTT}^{rB} = S_{EkTT}^{r} + B_{k}^{r},$$

where TT is the last year in the reference period for the k-year estimates (e.g., TT = 13 for the 5-year estimates for 2009-2013), and B_{k}^{f} and B_{k}^{r} are the benchmarking adjustments calculated in Step 1.

AEO claiming rates are

$$C_{AEO}^{f} = \left(S_{CkTT}^{fB} / 100\right),$$
$$C_{AEO}^{r} = \left(S_{CkTT}^{rB} / 100\right), \text{ and}$$
$$C_{AEO}^{p} = 1 - C_{AEO}^{f} - C_{AEO}^{r}.$$

SOURCE: Prepared by the panel.

In addition to certification rates and participation rates for at least 3 years, the district will need to have total enrollment (E) and the total number of students who live in nontraditional housing and are categorically eligible for free meals (H) in each year. The adjustment will be applied to ACS eligibility estimates, before benchmarking, as illustrated in Box 5-12. The adjusted ACS estimates will then be used in all benchmarking equations instead of the unadjusted numbers.

MONITORING BY FNS

The accuracy of both ACS and administrative estimates may vary over time. ACS sample sizes may be cut. Continued improvements in direct certification may reduce certification error. Some changes in the quality of estimates may affect the accuracy and stability of AEO benchmarking adjustments for districts that are considering the AEO, as well as districts that have already adopted it. Thus, it is important that FNS track such changes, identify their causes, and assess their implications.

These activities should be conducted for a broad sample of districts that are potential candidates for adopting the AEO but are not operating

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BOX 5-12
Adjustment of ACS Eligibility Percentages to Account for Students Who Live in Nontraditional Housing

E = total enrollment, and
H = total number of students who live in nontraditional housing and are categorically eligible for free meals.

ACS eligibility estimates are adjusted as follows:

$$S_{EkYY}^{fA} = \frac{S_{EkTT}^{f}(E-H)+H}{E},$$

$$S_{EkYY}^{rA} = \frac{S_{EkTT}^{r}(E-H)}{E}, \text{ and}$$

$$S_{EkYY}^{pA} = \frac{S_{EkTT}^{p}(E-H)}{E}.$$

SOURCE: Prepared by the panel.

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under the AEO or any other special provision or option.[20] Within this sample, separate analyses should be performed for high and very high FRPL districts (or for a more detailed categorization of districts) and for small, medium, and large districts. Because the districts in the sample are operating under traditional procedures, ACS eligibility estimates can be compared with administration certification estimates, as the panel has done in this report.

FNS also should monitor the accuracy of ACS eligibility estimates for districts that have already adopted the AEO and are no longer certifying students. To facilitate such monitoring, the panel suggests that FNS allow districts that have adopted the AEO to continue working with state agencies to match district enrollment lists with lists of SNAP recipients, as is done for direct certification, and derive SNAP recipiency rates.[21] Then, the relationships between these SNAP recipiency rates and ACS eligibility estimates can be analyzed to identify districts with substantial changes

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[20]One limitation of this sample for learning about changes that might be affecting districts that have already adopted the AEO is that it will become more selective over time, consisting of proportionately more districts for which the AEO is not attractive.

[21]Temporary Assistance for Needy Families (TANF) and Food Distribution Program on Indian Reservations (FDPIR) lists can also be used if the district has previously used them for direct certification.

over time. Analyses can be conducted not only for the districts that have adopted the AEO but also for districts that are still potential candidates for doing so.[22]

SUMMARY

The AEO may give school districts a new opportunity to provide free meals to all students. The AEO base year is essentially the same as a Provision 2 base year. During this year, the district continues to take applications, conduct verifications, and count meals served by category; however, all meals are served free. During the base year, the district is reimbursed based on meals served by category as in the traditional approach. The increase in participation due to offering free meals to all students can then be estimated and incorporated into claiming percentages.

There are several key differences between the AEO and Provision 2. First, under the AEO, no additional base years are required because the ACS estimates released each year provide the means for updating claiming percentages in response to changing socioeconomic conditions. Even schools operating under Provision 2 or 3 may find the AEO attractive because it eliminates the requirement to conduct a base year every 4 years. Second, as just noted, districts need not rely on exactly the same claiming percentages every year under the AEO. Instead, with estimates provided annually by a highly credible and reliable source, the U.S. Census Bureau, districts can use the AEO Calculator to determine updated benchmarked eligibility percentages and claiming percentages that are then used in conjunction with the total number of meals served to determine monthly reimbursements. Third, if a school or district has high numbers of homeless students or migrant students living in nontraditional housing, the district also can adjust the ACS estimates to include those students.

Adopting the AEO will not be burden-free for states and districts, although the tasks they will need to perform are completely different from those required by current administrative processes. If districts wish to implement the AEO for only a group of schools, for example, they must be able to provide accurate geographic boundary information on the attendance areas encompassed by that group of schools.[23] Ideally, this information will be provided to the Census Bureau through FNS and will consist of a list of the census blocks that make up the school catchment areas of interest. Furthermore, a district may need to address limitations

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[22]If a district is operating under the AEO in a subgroup of schools, the analysis can be conducted for that subgroup.

[23]Implementation districtwide will be easier in this regard because the Census Bureau maintains school district boundaries through its biennial School District Review Program.

BOX 5-13
Other Uses of Data on Students Certified
for Free and Reduced-Price Meals

School meals program certification status is widely used to measure whether students are economically disadvantaged. One of the most significant uses is for Title I, Part A of the Elementary and Secondary Education Act of 1965 (ESEA), as amended. Under ESEA section 1113, a local education agency (LEA) must rank its schools based on the percentage of economically disadvantaged students in each school to determine a school's eligibility for receiving Title I funds and to allocate funds to selected schools.

To meet these requirements, an LEA must have school-level data on individual economically disadvantaged students. For many districts, information from the National School Lunch Program is likely to be the best, and perhaps the only, source of data available to identify those students. Moreover, in the case of the priority for public school choice and eligibility for supplemental education services, the No Child Left Behind Act of 2001 (NCLB) specifically requires a district to use the same data it uses for making within-district Title I allocations: historically, most LEA's use school lunch data for that purpose.[a]

In May 2011 the Department of Education issued guidance to state education officers on how to report the percentage of economically disadvantaged students and assess economic status for individual students under the new Community Eligibility Option (CEO). The guidance states that all students in a CEO school, just as in Provision 2 and 3 schools, are to be reported as economically disadvan-

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of the ACS. For example, the ACS does not represent all populations with equal accuracy. If a school or district has high numbers of homeless students or migrant students living in nontraditional housing, it will be in the district's interest to augment and refine its ACS estimates with supplementary information available at the local level. The accuracy of the ACS information also is affected by the degree to which open enrollment policies, charter schools, and other school choice opportunities affect whether students attend schools outside their normal attendance areas. States and districts, perhaps in collaboration with FNS or other agencies, will need to determine whether such local attendance policies have an effect on the accuracy of ACS estimates and whether the proposed benchmarking procedure corrects effectively for any errors. An individual district will also be able to monitor whether the number of students exercising the choice to leave the district is rising sharply. If the district has not yet adopted the AEO, certification data are available for use in comparing certification

taged for purposes of NCLB accountability reporting, implementing supplemental educational services, and identifying priority for school choice. When annually ascertaining the eligibility of a CEO school to receive Title I funding and determining its Title I allocation, LEAs are instructed that the percentage of economically disadvantaged students is equal to the percentage of meals reimbursed at the free rate—that is, the product of the statutory multiplier specified in the Healthy, Hunger-Free Kids Act (initially 1.6) and the percentage of "identified" students in the school during either the base year or a more recent year (up to a maximum of 100 percent). Provision 2 and 3 schools use the number of free and reduced-price students identified in the base year divided by enrollment in that year.

In our survey of Provision 2 and 3 districts (see Appendix E), the panel identified other uses of free and reduced-price data in addition to Title I and NCLB. One commonly mentioned program is E-rate.[b] Districts also noted the need for individually identifiable data for grants and for waived and reduced textbook, activity, and other fees for qualifying students. Typically, a family is asked to complete a waiver to allow sharing of individually identifiable eligibility information on free and reduced-price meal status (which otherwise is considered confidential) for purposes of obtaining waived and reduced fees and other benefits.

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[a]From Department of Education memorandum to State Education Officers from Commissioner of Education, Hanely, May 20, 2011.

[b]The Schools and Libraries Program of the Universal Service Fund, commonly known as E-Rate, is administered by the Universal Service Administrative Company under the direction of the Federal Communications Commission. It provides discounts to assist most schools and libraries in the United States in obtaining affordable telecommunications and Internet access. See http://www.universalservice.org/sl/about/overview-program.aspx.

SOURCE: Prepared by the panel.

percentages for students who have exercised choice opportunities and left the district with the certification percentages for students who have remained enrolled in district schools. If certification data are no longer available because the district has already adopted the AEO, the district will be able to match enrollment lists with SNAP records to derive SNAP recipiency rates, as described above. Then, the district will be able to compare SNAP recipiency rates for students who have left and those who remain. Such comparisons will reveal whether school choice opportunities are disproportionately attracting students from higher- or lower-income families and changing the composition of students who remain enrolled in the district in terms of their eligibility for free or reduced-price meals.[24]

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[24]The analyses described can be performed for the schools in which the AEO has been or might be adopted, rather than for the whole district.

The methodology proposed by the panel provides a district with estimates that it can use to fulfill other data requirements. Box 5-13 describes some of these uses. Benchmarked eligibility percentages, for example, can be used in place of aggregate certification percentages for purposes of ranking schools based on the percentages of economically disadvantaged children. As with Provisions 2 and 3 and the Community Eligibility Option (CEO), for purposes of Title I reporting of progress of students toward meeting education goals by subgroup, all students attending an AEO school can be classified as economically disadvantaged. Other needs for data concerning the status of economically disadvantaged children can similarly be met with one of these two approaches.

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Recommendations for Future Work

Chapter 5 describes an approach to using estimates from the American Community Survey (ACS) as part of an ACS Eligibility Option (AEO) for the National School Lunch Program (NSLP) and School Breakfast Program (SBP). In conducting our analyses, the panel encountered issues related to data quality and availability that the Food and Nutrition Service (FNS) or other federal agencies should address regardless of whether FNS chooses to implement the AEO (see Recommendations 1-5 below). Additionally, we identified research activities that could improve ACS estimates for all uses, particularly those that require estimating whether low-income individuals are eligible for benefits from various assistance programs, including the school meals programs (see Recommendations 6 and 7 below). Finally, FNS should pursue recommendations 8-16 if it chooses to implement the AEO.

IMPROVING DATA QUALITY AND AVAILABILITY

The panel identified four areas of improvement for data related to the school meals programs: (1) regularly producing and disseminating ACS estimates of schoolchildren eligible for free and reduced-price meals according to our specifications, (2) improving the comparability and quality of relevant administrative records on enrollment and certification, (3) improving the comparability and quality of relevant administrative records on participation, and (4) obtaining information on the costs of operating the traditional certification process for use in evaluating alter-

native provisions. We also identified the need for FNS to remove a barrier to the adoption of special provisions for the school meals programs by working with the Department of Education and states to promote the use of data sources other than NSLP counts of free and reduced-price certification for determining eligibility for or otherwise administering a variety of other programs.

The first area for data improvement pertains to the availability of school district-level ACS estimates for percentages of children eligible for free, reduced-price, and full-price meals under the school meals programs. The National Center for Education Statistics (NCES) already receives such estimates annually from the Census Bureau. However, specifications for these tabulations differ from those used by the panel. While research may improve our specifications in the future, we consider them to be the best available at present for producing estimates that most closely replicate program eligibility rules.

> **Recommendation 1: The Food and Nutrition Service should work with the National Center for Education Statistics and the U.S. Census Bureau to produce improved annual school district-level estimates (and their standard errors) for total enrollment and percentages of students eligible for free, reduced-price, and full-price meals under the school meals programs from the American Community Survey. These direct American Community Survey estimates should be based on the approach documented by the panel in its specifications to the Census Bureau (see Appendix D)[1] and should be produced for 1, 3, and 5 years of data. The estimates should be publicly available on an annual schedule.**

The second area for data improvement concerns the comparability and quality of various administrative data sources, in particular the two sources with school district-level data on enrollment and students certified for free and reduced-price meals—the NCES Common Core of Data (CCD) and form FNS-742.[2] These data sources are not easily linked, and once linked, they exhibit troubling discrepancies.

The panel was fortunate to have received from FNS a copy of a May 21, 2010, report entitled *VSR-CCD Linkfile*.[3] This report documents

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[1]The approach should be augmented as appropriate based on further research.

[2]While we refer generically to "school district-level data," these two data sources actually obtain reports for entities that are not always the same. Form FNS-742 obtains reports for school food authorities (SFAs), while the CCD obtains reports for local education agencies (LEAs). See footnote 3 below for additional detail.

[3]*VSR-CCD Linkfile*, a report by Mathematica Policy Research, was delivered to FNS on May 21, 2010, and provided to the panel by FNS. The project director was Nancy Cole. The

how to link data from form FNS-742 across years and with data from the CCD, and an accompanying data file provides the information needed to link data for several years from the two sources. We used the report and file in developing the database that supported all of our comparative analyses. FNS and NCES should build on this work to better align the two data collection systems. In particular, FNS should consider requiring school food authorities (SFAs) to make use of their NCES ID when submitting data. The NCES IDs would need to be adapted to cases in which SFAs and local education agencies (LEAs) are not the same. This would greatly facilitate appropriate linkage between the two systems.

CCD and FNS-742 data on enrollments and numbers of students certified for free and reduced-price meals differ substantially for some school districts. There is officially a 1-month time lag between the reporting periods for the two data sets that might explain some of the differences.[4] In some districts, however, the data are identical. In these cases, either the districts are not observing the reporting date distinctions or the data are the same at the beginning and the end of October. NCES should consider changing its reporting date for certification data from the school meals programs to align with the date used for form FNS-742.

Another reason for differences between CCD and FNS-742 data is that even in districts where the SFA and LEA are the same, one or more schools in the LEA may not participate in the school meals programs, and one or more schools in the SFA may not be regular schools in the LEA. These differences should be noted in the data sets. Additionally, both sources could be improved by incorporating specific indicators for data that are missing versus true zeros, and both systems would benefit from improved editing to address data entry errors.

> **Recommendation 2: The Food and Nutrition Service and the National Center for Education Statistics should work together with their respondents—states and school districts—to understand the differences between reporting in the Common Core of Data and on form FNS-742, and implement improvements to make the two data sources as consistent as possible while clearly documenting necessary and legitimate distinctions between them.**

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report notes reasons for differences between Verification Summary Report (VSR) data (from form FNS-742) and CCD data. It explains that while there was usually a one-to-one match, the primary exceptions occurred when SFA operations were centralized for multiple school districts. Places where this was common include Montana, New Hampshire, and New York City. In 2008-2009, there were 14,717 (unduplicated) SFAs in the VSR file, 95.5 percent of which matched with the CCD data.

[4]CCD data are to be reported as of October 1, or the closest school day to October 1, while the FNS-742 data are to be reported as of the last operating day in October.

A third area for improvement concerns data on participation in the school meals programs. Participation data collected on form FNS-10 are available in files with nationwide coverage only at the state level, and it is difficult even at the state level to obtain consistently defined estimates of participation and estimates of enrollment and certification for the same groups of schools (public, private, and residential child care institutions) for the same time period (annual, monthly). Furthermore, the only data available for school districts that are operating under Provision 2 or 3 are enrollment and certification data collected on form FNS-742, and these data are not available for those districts' base year(s). To enhance the availability of data at a lower level of aggregation than the state, FNS should pursue obtaining data on the number of meals served by eligibility category and on average daily participation for the month of October that are linkable to certification data by category at the school district level for all school districts in the nation. In addition, form FNS-742 should be augmented to collect data on whether a district provides universal free meals; which provision or option (if any) is used to provide free meals; whether universal free meals are provided at breakfast, lunch, or both; whether universal free meals are provided in all schools or only a subset of schools; and whether the district is operating a base year. Items currently collected for districts operating under Provision 2 or 3, not in a base year—number of schools, enrollment, and certification counts—should also be collected during a base year (for all special provisions including the AEO). For districts that provide universal free meals in only a subset of schools, form FNS-10 should obtain meal counts by category separately for schools providing all meals free and those operating under traditional procedures. The additional data would support studies of participation, including changes in participation experienced by a district when providing free meals during a base year. The data would also support analysis of differences between the distributions of certified students and meals served across the free, reduced-price, and full-price categories.

Recommendation 3: The Food and Nutrition Service should make the following enhancements to its form FNS-10 and FNS-742 data sets:

- **Improve the FNS-10 and FNS-742 data sets to ensure that consistent state-level data on enrollment, certification, and participation for the same groups of schools, the same time periods, and the two programs (National School Lunch Program and School Breakfast Program) can be readily obtained.**
- **Expand the collection of FNS-10 data items to include meals served by category (free, reduced price, full price) and average**

daily participation, at least for the month of October and for lunch and breakfast separately; whether the district provides universal free meals and the provision or option used (if any); and whether a provision or option has been adopted in all schools or only a subset of schools.[5] Such data should be collected for all school districts in the nation and maintained in a form that is directly linkable to the FNS-742 data concerning enrollment and certification.

- **Collect more complete information on form FNS-742 on the use of special provisions and other options that entail offering universal free meals.**
- **Consider implementing a data collection process that offers a web-based interface for entering source data and that supports appropriate entry, approval, and view access for each level of reporting (school, district, state, and nation).**

A fourth area for data improvement concerns administrative cost information for evaluating the savings that could accrue from the elimination of administrative tasks under a universal free meals option. The panel attempted to collect administrative cost information from our five case study districts and made use of cost data from the U.S. Government Accountability Office (2002). However, we determined that the data were too inconsistent to be useful for even a crude cost analysis of a universal free meals option. Hence, we recommend that FNS consider the development of a mechanism for periodic collection of data on administrative costs in the NSLP and SBP. We recognize that a barrier is the diversity of accounting systems used by states and school districts, and as a result, collecting such data in a standardized format may require burdensome changes in school district accounting procedures. FNS should first collaborate with selected school districts and states on a feasibility study to develop meaningful working definitions of the costs that need to be tracked and then illustrate the application of these definitions by collecting cost data in a randomly selected sample of districts.

> **Recommendation 4: The Food and Nutrition Service should study the feasibility of developing a program for periodic collection of data on administrative costs in the school meals programs. It should first collaborate with selected school districts and states to develop meaningful working definitions of the costs that need to be tracked**

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[5]For districts that provide universal free meals in only a subset of schools, form FNS-10 should collect meal counts separately for the schools that provide universal free meals (whether in a base year or not) and those that operate under traditional procedures.

and then illustrate the application of the definitions and procedures for collecting cost data in a randomly selected sample of districts.

Finally, the panel noted that school districts, states, and other federal organizations use information on certification for free and reduced-price meals, in the aggregate and for individual students, to administer other programs and confer benefits. For example, school meals certification is used individually to qualify students for free band uniforms and textbooks and for other benefits at the local level, individually (but aggregated to the classroom level) to qualify teachers for bonuses where authorized by state law, in the aggregate to qualify schools as eligible to receive funds under Title I of the Elementary and Secondary Education Act (ESEA) of 1965 (as amended), and individually for reporting educational progress for economically disadvantaged students in Title I schools under the ESEA (as amended by the No Child Left Behind Act of 2001). The challenge is that special provisions and options, which would include the AEO, eliminate the annual certification of students and tabulation of free and reduced-price certification numbers in most years, rendering these data unavailable for other uses.

In May 2011, the U.S. Department of Education issued a memorandum stating that Community Eligibility Option (CEO) schools, like those operating under Provision 2 or 3, could use other data for various provisions of the ESEA (e.g., CEO schools could deem all of their students economically disadvantaged for individual purposes and use the reimbursement claiming percentage for free meals for aggregate purposes).[6] However, either participants in the panel's workshop and Provision 2/3 survey respondents did not know that other data sources could be used, or these options are not widely acknowledged as being applicable for other state and local uses of the data. Regardless of how attractive any of the special provisions may be to local operators of the school meals programs who would like to benefit more low-income children by expanding access to free school meals, the need to provide data for other critical programs may discourage them from adopting a special provision.[7]

The Department of Education memorandum applies only to reporting of data under the ESEA, and does not apply to requirements to qualify individual students for income-conditioned benefits offered by schools or states. One option would be for states or school districts to allow schools

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[6]Memorandum from Carl Harris, deputy assistant secretary of education, to state commissioners of education, dated May 20, 2011; refer back to Chapter 2 for details.

[7]The panel was told that Denver had been operating under Provision 2 for a time but discontinued it in part because teachers could not receive state-authorized bonuses based on the proportion of economically disadvantaged students in their classes.

operating under the CEO, Provision 2 or 3, or the AEO to deem all of their students economically disadvantaged, the approach used in the Department of Education memorandum. Alternatively, it may be possible to identify students who are on state and local lists (e.g., participants in the Supplemental Nutrition Assistance Program [SNAP, formerly the Food Stamp Program] and foster children) as eligible for other benefits. The decision about which approach to use would depend on how states and districts employ these data for other purposes.

> **Recommendation 5: The Food and Nutrition Service should broadly disseminate to state and local authorities the U.S. Department of Education guidance that permits schools operating under a special provision for school meals to use alternative data for Department of Education purposes for which traditional National School Lunch Program certification data would otherwise be used. The Food and Nutrition Service should also encourage state and local authorities to allow districts that choose to operate under a special school meals provision to use alternative, specified data or methods for determining aggregate and individual measures of economic status for other income-conditioned benefits or reporting.[8]**

IMPROVING ACS ESTIMATES

The panel identified two research areas for improving ACS estimates. The first is additional research on the definition of an economic unit for estimating students who are eligible for free or reduced-price school meals. The second is additional research on the quality of the ACS estimates, particularly the effects on quality of (1) underreporting of income and program participation in the survey and (2) the difference between the income accounting period used in the ACS (annual, for the previous year) and that used administratively for determining eligibility (current or past month).

While the panel was comfortable that the definition of an economic unit we specified for ACS estimates of students eligible for the school meals programs was balanced and reasonable given the short time period of this study, the topic would benefit from additional research. For example, one could use the Current Population Survey Annual Social and Economic Supplement (CPS ASEC) or the Survey of Income and Program Participation (SIPP) to evaluate our methodology for using available ACS variables to define an economic unit. The CPS ASEC and SIPP collect more detailed information than the ACS on subfamilies and relationships for individuals who are unrelated to the householder, as well as more detailed informa-

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[8]See Recommendation 8 on the AEO specifically.

tion on receipt of benefits from SNAP, Temporary Assistance for Needy Families (TANF), and the NSLP. Both surveys suffer from underreporting of such benefits (as does the ACS—see below). However, with person-level data on SNAP participation, the CPS ASEC or the SIPP (or both) could be used, for example, to assess the impact of assuming that if one person in the household is participating in SNAP, all students in the household are participating and are therefore eligible for free meals. With detailed information on how members of the household (even those unrelated to the householder) are related to one another, one could directly assess the definition of an economic unit adopted by the panel. With longitudinal data from the SIPP, it might be possible to assess the extent to which the economic units at survey time differ from those at other points in the year during which income was accrued. Another source of information with which to evaluate our definition of an economic unit might be based on simulations with ACS data using the Minnesota Population Center's Integrated Public Use Microdata Series (IPUMS) methodology of imputing household relationships instead of our assumptions.[9]

> **Recommendation 6: The Food and Nutrition Service should support research to assess the quality of the panel's definition of an economic unit for use in determining eligibility for the school meals programs from the American Community Survey and suggest alternatives that would improve that definition.**

Systematic differences between ACS eligibility estimates and administrative certification estimates also should be evaluated. These include the underreporting of income and program benefits, particularly SNAP benefits, on the ACS (and other household surveys) and the understatement of eligibility based on using annual income (the only measure available in the ACS) rather than monthly income (which is used by school districts to certify students for free or reduced-price school meals). The policy research community and the Census Bureau should continue to investigate these issues and ways to ameliorate their effects on the quality of the ACS estimates. For example, the Census Bureau should do more to evaluate the quality of the ACS data, particularly with respect to the reporting of SNAP participation, and could explore use of the CPS-SNAP direct match study (Meyer and George, 2011) to determine how best to impute participation from administrative data.

> **Recommendation 7: The policy research community and the Census Bureau should continue to investigate causes of and solutions for**

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[9]See http://usa.ipums.org/usa/chapter5/chapter5.shtml.

the underreporting of income and benefits, particularly from the Supplemental Nutrition Assistance Program, in the American Community Survey and the differences in estimates of eligibility for the school meals programs based on monthly and annual income.

FACILITATING IMPLEMENTATION OF
THE ACS ELIGIBILITY OPTION

The panel has proposed a way to use ACS data in implementing the AEO. Should FNS decide to implement the AEO, the panel has the following recommendations (8 through 16) to facilitate the process. The first parallels Recommendation 5 above, but addresses only Department of Education uses of the data.

Recommendation 8: The U.S. Department of Education and the Food and Nutrition Service should agree that school districts that choose to participate in the American Community Survey Eligibility Option may use data other than traditional certification of eligibility for school meals for individual and aggregate reporting of economically disadvantaged children under the Elementary and Secondary Education Act of 1965. In particular, the panel suggests that for aggregate reporting, a district should use its most recent benchmarked American Community Survey eligibility estimates, and that for individual reporting, a district should be allowed to designate all students enrolled in an American Community Survey Eligibility Option school as economically disadvantaged. These recommendations parallel the guidance already provided by the Department of Education for students enrolled in a Provision 2, Provision 3, or Community Eligibility Option school.

Successful adoption of the AEO by school districts will require training and assistance from FNS. For example, states will need to learn how to use ACS estimates to implement the AEO and carry out other AEO startup activities so they can provide information and assistance to districts that are candidates for adopting this new provision. It will be useful for state agencies, for example, to regularly identify school districts that are candidates for adopting the AEO, perhaps because of a high percentage of students certified for free or reduced-price meals under traditional operating procedures, and to provide them with training and technical assistance to facilitate the assessment and implementation of the AEO.

As part of this training and assistance, FNS should develop a simple, easy-to-understand document explaining how the AEO would work, including an explanation of how ACS estimates should be interpreted.

FNS also should provide districts with an easy-to-use Web tool (the AEO Calculator) to help them assess the desirability of the AEO and prepare updated benchmarked estimates annually. As described in Chapter 5, districts would enter their data, and the AEO Calculator would compute the necessary statistics and display results in useful ways to help districts determine whether they are good candidates for the AEO. Use of the AEO Calculator also would facilitate communication among agencies about the ACS estimates.

> **Recommendation 9: The Food and Nutrition Service should provide technical assistance to help states and districts understand, evaluate the feasibility of, and implement the school meals American Community Survey Eligibility Option. This assistance should include easy-to-understand documentation and an American Community Survey Eligibility Option Calculator for districts to use in working with American Community Survey estimates of students eligible for the school meals programs.**

Should FNS decide to implement the AEO and allow it to be used for schools or groups of schools, FNS will need to establish an agreement with the Census Bureau regarding the necessary data requests, including the provision of geographic boundary information for school attendance areas. In particular, the panel believes it is important that FNS serve as the conduit for such requests—providing technical assistance to districts on the establishment of geographic boundaries for school attendance areas, collecting all necessary boundary information from districts, and sending all requests to the Census Bureau on a fixed annual schedule. Data to be provided by the Census Bureau should include all relevant estimates for, initially, at least three consecutive releases of ACS data (e.g., 2005-2009, 2006-2010, and 2007-2011 if 5-year estimates are provided). Thereafter, new estimates would be provided annually with each subsequent release of ACS data.

> **Recommendation 10: If the American Community Survey Eligibility Option is to be implemented for a subset of schools within a school district, the Food and Nutrition Service and the U.S. Census Bureau should reach agreement on how and when geographic boundary information for school attendance areas will be provided to the Bureau and how and when the American Community Survey estimates for the schools or group of schools will be delivered.**

Districts that wish to implement the AEO for a group of schools will need to obtain and evaluate boundary information either individually for the schools or for the group of schools. The boundary information

will need to be in the form of a list of census blocks that make up the individual school attendance areas or the attendance area for the group of schools. Possible sources for such boundary information include (1) the district's local planning office, (2) the School Attendance Boundary Information System (SABINS),[10] (3) the use of remote digitizing software,[11] and (4) the use of a geographic information system (GIS) by a local staff person. Because census blocks are used to define the boundaries for Census Bureau estimates, districts will need to evaluate the list of census blocks that correspond to the geographic area to be included in the AEO for omission or inclusion of large groups of students (e.g., because a large apartment complex is partly within and partly outside the area). As noted above, FNS should provide technical assistance in this process.

> **Recommendation 11: The Food and Nutrition Service should provide technical assistance to school districts that wish to participate in the American Community Survey Eligibility Option only for a school or group of schools with respect to sources for and preparation of the geographic boundary information for school attendance areas needed to derive American Community Survey eligibility estimates for the school meals programs.**

The AEO should be evaluated carefully in districts that are early adopters. Early in the implementation of the AEO, these districts could be designated as demonstration sites to which FNS would provide financial assistance to support extra data collection. FNS also could sponsor an independent evaluation of the demonstration projects. Although the panel believes our approach for using ACS estimates for the AEO is promising, the lack of high-quality comprehensive data—particularly regarding the likely effects on participation and administrative costs, the effect of school choice policies (e.g., independent charter schools) on the validity of estimates, and the accuracy and stability of the AEO benchmarking adjustments over time—made it impossible for us to provide more definitive conclusions and guidance regarding the AEO's desirability and feasibility for all or nearly all districts in the nation.

> **Recommendation 12: The Food and Nutrition Service should designate some of the school districts that are early implementers of the**

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[10]In February 2012, the panel learned that SABINS will be funded by NCES, which plans to update it annually and gradually increase its geographic coverage (see http://www.sabinsdata.org/home).

[11]The panel also learned that NCES plans to ultimately host a remote digitizing service, initially prepared as part of SABINS but was still in testing as of February 2012.

American Community Survey Eligibility Option as demonstration sites and provide them with additional resources for data collection. The Food and Nutrition Service also should commission an independent evaluation of the demonstration projects.

The panel's assessment of the effects of school choice, particularly the impact of charter schools and open enrollment, on residence-based eligibility estimates focused on only two school districts in much depth. While we generally believe that large effects of school choice are not widespread, the prevalence of charter schools and open enrollment has been growing, and the extent to which school choice has an impact on estimates of eligibility for the school meals programs in schools and school districts should be considered in future research.

Recommendation 13: The Food and Nutrition Service should work with the U.S. Department of Education and the education research community to monitor the prevalence of school choice provisions, such as charter schools and open enrollment, and their impact on school meals eligibility percentages for public schools and districts. The findings from such monitoring should be used to evaluate the potential effects of school choice on the accuracy of eligibility percentages estimated for the American Community Survey Eligibility Option, that is, eligibility percentages based on residence in the catchment area of a school or district rather than on actual enrollment in the school or district.

Ideally, the ACS would itself provide additional detail on types of schools attended in addition to simply public versus private. Because the ACS is mandatory and is designed to cover many subject areas, however, the ability to add more questions on any one topic is limited. Nonetheless, simply adding a third category of "charter school" together with "regular public school" and "private school" would be helpful to the policy and research communities.[12]

The accuracy of both ACS and administrative estimates could vary over time and would, it may be hoped, improve. Some of these changes in quality could affect the accuracy and stability of AEO benchmarking adjustments for districts that are considering the AEO, as well as those that have already adopted it. Thus, it is important that FNS track such changes, identify their causes, and assess their implications.

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[12]This information would likely be useful for purposes in addition to the AEO.

Recommendation 14: The Food and Nutrition Service should monitor the accuracy of American Community Survey estimates of eligibility for the school meals programs, the accuracy of administrative certification estimates, and the accuracy and stability of differences between American Community Survey and administrative estimates. Such monitoring should be conducted for a broad sample of districts that are potential candidates for adopting the American Community Survey Eligibility Option but are not operating under that option or any other special provision or option. The Food and Nutrition Service also should monitor the accuracy of American Community Survey eligibility estimates for districts that have already adopted the American Community Survey Eligibility Option.

The benchmarking approach proposed by the panel for adjusting the ACS eligibility estimates for a consistent difference from administrative certification estimates uses only district-specific ACS and administrative data. The predictive modeling approach described in Chapter 4 and documented in Appendix F, which uses data from all districts as well as district-specific data to develop a benchmarking adjustment for each district, has some technical appeal and would benefit from additional research. In particular, FNS might sponsor research to develop and test a global predictive model that might be used for benchmarking either alone or in conjunction with a subsequent benchmarking adjustment based entirely on district-specific data.

Recommendation 15: The Food and Nutrition Service should sponsor research to develop and test a global predictive model for developing American Community Survey estimates of eligibility that are benchmarked to certification data for the school meals programs.

The specification and implementation of ACS school district-level model-based eligibility estimates produced by the Census Bureau and their subsequent evaluation by the panel took place in a brief time period. Although we could not recommend the use of the model-based estimates in place of the direct estimates at this time, the current models and estimates can be viewed as a proof of concept, and we believe refinement of a model-based approach could lead to more accurate and timely estimates than direct ACS estimates for many if not all school districts. Should implementation of the AEO prove successful, FNS should consider working with the Census Bureau to develop improved ACS model-based estimates. Specific suggestions for potential improvements in the models and estimation procedures are provided in Appendix C.

Recommendation 16: The Food and Nutrition Service should work with the U.S. Census Bureau to improve the methodology used in support of this study (see Appendix C) to prepare the American Community Survey small-area model-based estimates of eligibility percentages for free and reduced-price meals.

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Appendix A

Glossary of Acronyms and Terms

ACRONYMS

ACS	American Community Survey
AEO*	ACS Eligibility Option
APEC	Access, Participation, Eligibility, and Certification Study (U.S. Department of Agriculture/Food and Nutrition Service, 2007b)
BRR*	blended reimbursement rate
CAPI	computer-assisted personal interviewing
CATI	computer-assisted telephone interviewing
CCD	Common Core of Data
CEO*	Community Eligibility Option
CPI	Consumer Price Index
CPS	Current Population Survey
CPS ASEC	Current Population Survey, Annual Social and Economic Supplement
CV	coefficient of variation
ESEA	Elementary and Secondary Education Act of 1965
FDPIR	Food Distribution Program on Indian Reservations
FNS	Food and Nutrition Service
FRPL	free or reduced-price lunch

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GED	general educational development
GVF	generalized variance function
IOM	Institute of Medicine
LEA*	local education agency
NCES	National Center for Education Statistics
NCLB	No Child Left Behind Act of 2004
NSLP	National School Lunch Program
PUMA	Public Use Microdata Area
PUMS	Public Use Microdata Sample (file)
QC	quality control
RMSD	root mean squared difference
SABINS	School Attendance Boundary Information System
SAIPE	Small Area Income and Poverty Estimates (program)
SBP	School Breakfast Program
SE	standard error
SFA*	school food authority
SIPP	Survey of Income and Program Participation
SNA	School Nutrition Association
SNAP	Supplemental Nutrition Assistance Program (formerly the Food Stamp Program)
SNDA-III	School Nutrition Dietary Assessment Study III (U.S. Department of Agriculture/Food and Nutrition Service, 2007a)
SSI	Supplemental Security Income
TANF	Temporary Assistance for Needy Families
TIGER	Topologically Integrated Geographic Encoding and Referencing (system)
UNO	University of Nebraska at Omaha

NOTE: An asterisk indicates that the term is defined below.

TERMS[1]

ACS Eligibility Option
In this report, the term used to refer to a new special provision that would provide free meals to all children. Schools, groups of schools, or school districts establish claiming percentages for federal reimbursement using American Community Survey (ACS) estimates for eligibility in conjunction with information collected during a base-year trial period. During the base year, applications are taken, and the district makes eligibility determinations, conducts verification, and counts meals by type (but does not charge for meals). After the base year, no new eligibility determinations or verification checks are required, and the district counts only the total number of reimbursable meals served each day.

Application
Local education agencies send students' parents a letter just prior to or at the beginning of a school year describing the school meals programs, inviting them to apply, and providing an application form. The application requests information about program participation, family composition, and family income. School or district officials review the applications submitted and, within 10 working days of receiving an application, make a determination as to whether the child should be approved for free or reduced-price meals. If an application lists a legitimate case number for the Supplemental Nutrition Assistance Program (SNAP, formerly the Food Stamp Program) or other approved program, the student is certified as being categorically eligible for free meals.

Approved
Students who have been directly certified as eligible for free meals or who have applied for benefits and have been determined to be eligible for either free or reduced-price meals.

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[1]The panel determined which terms used in the school meals programs to include here based on its experience in preparing this report.

Blended reimbursement rate	The average reimbursement per meal served in a given month or year. It uses the approved reimbursement rates per certification category in that year and claiming rates associated with the traditional method or alternatives such as Provision 2, Provision 3, the AEO, or the CEO (see *claiming percentages*).
Categorical eligibility	Eligibility arising from the participation of a student's family in means-tested programs, such as the Supplemental Nutrition Assistance Program (SNAP, formerly the Food Stamp Program), Temporary Assistance for Needy Families (TANF), or the Food Distribution Program on Indian Reservations (FDPIR). A student also is categorically eligible if a family member is enrolled in a Head Start or Even Start Program (based on meeting that program's low-income criteria) or if the student is (1) a homeless child, as determined by the school district's homeless liaison or by the director of a homeless shelter; (2) a migrant child, as determined by the state or local Migrant Education Program coordinator; or (3) a runaway child who is receiving assistance from a program under the Runaway and Homeless Youth Act and is identified by the local educational liaison.
Certification	The process of determining which enrolled students are eligible for the school meals programs. There are two subprocesses: application and determination of categorical eligibility.
Certified	See *approved*. Denotes a student who has been designated by the school as certified to obtain free or reduced-price meals through an application process or categorical eligibility. A student who has not applied for free or reduced-price meals and is not determined to be eligible through categorical eligibility is certified as eligible only for full-price meals.
Claiming percentages	Under the traditional school meals programs and Provisions 1, 2, and 3, the percentages of meals served in the three eligibility categories (free, reduced price, and full price). In Philadelphia, claiming rates are based on eligibility percentages determined from a

socioeconomic survey. Under the Community Eligibility Option, the claiming percentage for free meals is the percentage of students who are identified (see below), the claiming percentage for reduced-price meals is zero, and the claiming percentage for free meals is 100 minus the claiming percentage for free meals. Claiming percentages are called claiming rates if expressed as proportions.

Claiming rates   See *claiming percentages.*

Community   A new provision authorized in the Healthy, Hunger-
Eligibility   Free Kids Act of 2010. A district is eligible to partici-
Option   pate if 40 percent or more of enrolled students are
                          identified as eligible for free meals (see definition
                          below), and are reimbursed based on this percent-
                          age. This provision requires offering free meals to
                          all students. There are no base years. Districts must
                          conduct direct certification every 4 years but may do
                          so more often.

Direct   The process by which local education agencies iden-
certification   tify categorically eligible students based primarily
                          on their participation in the Supplemental Nutrition
                          Assistance Program (SNAP, formerly the Food Stamp
                          Program), Temporary Assistance for Needy Families
                          (TANF), or the Food Distribution Program on Indian
                          Reservations (FDPIR). The 2004 Child Nutrition and
                          WIC Reauthorization Act required that all school
                          districts establish a system of direct certification of
                          students from households that receive benefits from
                          SNAP by school year 2008-2009. Some states or dis-
                          tricts also make use of TANF or other program data
                          as part of direct certification. For direct certification,
                          states or districts match lists of students (including
                          names, addresses, etc.) with administrative data con-
                          cerning individuals participating in SNAP or other
                          assistance programs. Students matched in this way are
                          directly certified as being eligible for free school meals.

Eligible   Students are eligible for free school meals if their
                          family's "current" monthly income is no greater than
                          130 percent of the poverty level or if they are cat-

egorically eligible. Current income requested on the application form "may be for the current month, the amount projected for the first month the application is made for, or for the month prior to application."[2] Students are eligible for reduced-price meals if their family's current income is greater than 130 percent but no greater than 185 percent of the poverty level. All other students are eligible only for full-price meals. An eligible student is not necessarily certified.

Identified students

A term used in conjunction with the Community Eligibility Option. Identified students are those eligible for free meals by means other than applications, such as direct certification or through local agencies that provide lists (migrant, homeless, runaway, and so on).

Local education agency

The public board of education or other public or private nonprofit authority legally constituted in a state for the administrative control of public or private nonprofit schools in a political subdivision of the state; an administrative agency or a combination of school districts or counties that is recognized by the state; any other public or private nonprofit institution or agency having administrative control and direction of a public or private nonprofit school or residential child care institution; or the state education agency in a state or territory in which the state education agency is the sole education agency for all public or private nonprofit schools. The local education agency is responsible for the application, certification, and verification activities of the NSLP and SBP.

Meal count

The total number of meals served that satisfy nutritional requirements of the school meals programs by eligibility category (free, reduced price, and full price). Under the traditional school meals programs, cashiers determine whether a student's meal qualifies and whether the student is eligible for a free, reduced-price, or full-price meal. Meal counts recorded by each cashier are aggregated to provide

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[2]*Eligibility Manual for School Meals,* U.S. Department of Agriculture/Food and Nutrition Service (2011:40).

the school's daily meal counts. This process provides the meal counts maintained in school records that are used to determine federal reimbursements under the school meals programs.

Meals served — As collected on the FNS-10 form, the total number of meals served in a time period (usually a month) and the number of meals served in a given eligibility category (free, reduced price, or full price). These amounts are divided by the number of days meals are served to derive the average daily meals served. The number of meals served is the aggregate of daily meal counts over the time period.

Nutrition standards — School lunches and breakfasts must meet the applicable recommendations of the 2005 Dietary Guidelines. New standards were adopted in January 2012 based on recommendations from the National Research Council (2009) and as authorized in the Healthy, Hunger-Free Kids Act of 2010. The new standards seek to increase the availability of fruits, vegetables, whole grains, and fat-free and low-fat fluid milk in the school menu; reduce the levels of sodium, saturated fat, and trans fat in school meals; and meet the nutrition needs of school children within their calorie requirements.[3]

Overt identification — The Richard B. Russell National School Lunch Act (Section 7 9B(10):3-22) states: "(10) No physical segregation of or other discrimination against any child eligible for a free lunch or a reduced price lunch under this subsection shall be made by the school nor shall there be any overt identification of any child by special tokens or tickets, announced or published list of names, or by other means."[4]

Participation — The average daily number of meals served in a category (free, reduced price, or full price) divided, in official estimates, by .927 (to adjust for average daily attendance).

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[3]See http://www.gpo.gov/fdsys/pkg/FR-2012-01-26/pdf/2012-1010.pdf.
[4]See http://www.fns.usda.gov/cnd/Governance/Legislation/NSLA-10-2008.pdf.

Participation rate	Computed as the average daily number of meals served by category (free, reduced price, full price) in a month divided by the product of the total number of students approved in that category and the average daily attendance factor of .927.
Provision 1	Schools enrolling at least 80 percent of students who are approved for free or reduced-price meals can participate in Provision 1. They are permitted to certify students' eligibility for free or reduced-price meals for 2 years instead of reestablishing eligibility every year.
Provision 2	Schools, groups of schools, and entire school districts can participate in Provision 2. Participating schools establish claiming percentages for federal reimbursement through information collected during a base period and serve all meals at no charge for a 4-year period. The first year is the base year, in which the school makes eligibility determinations, conducts verification, and takes meal counts by type (but does not charge for meals). During the next 3 years, the school performs no new eligibility determinations or verification checks and counts only the total number of reimbursable meals served each day. Reimbursement is based on the total number of meals served and the claiming percentages that were observed in the same month of the base year.
Provision 3	Schools, groups of schools, and school districts provide free meals to all students for a 4-year period and receive the same level of federal cash and commodity assistance as they received in the base year, with some adjustment for enrollment, the number of operating days, and inflation. The base year does not count as one of the 4 years; it is the last year the school made eligibility determinations, counted reimbursable meals by type, and charged for the meals. For the subsequent 4-year period, schools must serve meals to all participating students at no charge, and they do not make additional eligibility determinations or conduct additional verification checks.

School district   Commonly denotes the entity responsible for administration of the school meals programs and reporting to the U.S. Department of Education at the local level. That entity may be officially known as the school food authority or the local education agency.

School food authority   The governing body responsible for the administration of one or more schools and having the legal authority to operate the school meals programs in those schools.

School year   The school year straddles 2 calendar years, and official start and stop dates vary. Official statistics on the school meals programs typically cover 9 months of the year, from September through May.

Verification   A process required by each local education agency (LEA) that participates in and takes applications for the school meals programs. The LEA is required to conduct an annual verification of 3 percent or 3,000 (whichever is smaller) of the applications approved and on file as of October 1 of the current school year, unless the state agency conducts the verification. The households that submitted the applications selected for verification are required to submit documentation of income for any point in time between the month prior to application and the time the household is required to provide income documentation. LEAs make at least one follow-up attempt with households that do not respond. Eligibility is revoked for students in households that fail to provide the required documentation. The outcomes of verification studies are reported annually on the FNS-742 form.

Appendix B

Estimates of Eligible Students Using the American Community Survey

I n developing an approach to direct estimation,[1] the panel's first task was to determine how data collected in the American Community Survey (ACS) can be used to reflect the eligibility criteria of the school meals programs. This task has several different aspects: (1) how to use ACS variables to identify public school students, (2) how to define an economic unit's income for purposes of evaluating a student's eligibility for school meals, (3) how to group individuals in households to define a student's economic unit for school meals eligibility, and (4) how to account for categorical eligibility using ACS variables. This appendix addresses issues associated with using the ACS to estimate the eligibility of students who live in households, the bulk of all public school students. As described in Chapter 3, the panel decided not to use the ACS to estimate the eligibility of students who live in group quarters. Instead estimates for these students will be provided by school districts. Another issue, discussed in Chapter 3, is how to use school-year eligibility guidelines with the calendar year ACS estimates.

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[1]By "direct" we mean an estimator that—when one is deriving estimates for a domain— uses data only from that domain, where a domain is defined by geographic area, population group, and time period. Although an American Community Survey (ACS) 5-year period estimate is, arguably, indirect by this definition, we consider it to be direct for present purposes.

IDENTIFYING PUBLIC SCHOOL STUDENTS

The ACS collects information about school attendance: whether the student has been attending school within the last 3 months, whether the school is public or private, and the grade attended. The ACS also collects information about each person's age. Hence for a given geographic area, it is possible to obtain estimates for students who live in that area, attend public school, and are in approximately the appropriate grade range. In defining public school students, the panel adapted the definitions used by the Census Bureau to support the research efforts of the National Center for Education Statistics (NCES). Namely, a "student" is a person with the following responses[2] to the ACS questions shown in Boxes B-1, B-2, and B-3[3]:

- yes, attended public school or public college at some time during the past 3 months,
- highest degree or level of school completed reported as "No schooling" or "Nursery or preschool through 12 grades," and
- age reported to be less than 20 years old.[4]

DEFINING INCOME

According to the *Eligibility Manual for School Meals,* U.S. Department of Agriculture/Food and Nutrition Service (2011:40)

households must report current income on a free and reduced price application. Current income means income received by the household for the current month, the amount projected for the first month for which the application is filled out, or for the month prior to application. If this income is higher or lower than usual and does not fairly represent the

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[2]ACS data for all individuals in a household are typically provided by one person in the household.

[3]Because the ACS identifies students based on their having attended school during the last 3 months rather than based on current attendance, there is a possibility that students in split families with joint custody may be living in a different household at the time of the ACS interview than they were when attending school. To the extent that children live with different parents at different times, this might cause ACS estimates to make use of the wrong household's income.

[4]NCES's definition of public school student is as described above except that NCES applies the test in the second bullet—high school diploma or GED not reported—only to students aged 18 or 19. Hence the NCES definition includes individuals aged 0-17 who reported that they have received a high school degree and also that they attended a public school in the last 3 months. The panel's definition excludes these individuals. According to the ACS Public Use Microdata Sample (PUMS) files for 2008, there were 245,609 students below age 18 with high school degrees or about .5% of the total number of students in 2008.

BOX B-1
ACS Questions on Schooling

10 a. At any time IN THE LAST 3 MONTHS, has this person attended school or college? *Include only nursery or preschool, kindergarten, elementary school, home school, and schooling which leads to a high school diploma or a college degree.*

☐   No, has not attended in the last 3 months   *SKIP to question 11*
☐   Yes, public school, public college
☐   Yes, private school, private college, home school

b. What grade or level was this person attending? *Mark (X) ONE box.*

☐   Nursery school, preschool
☐   Kindergarten
☐   Grade 1 through 12—*Specify grade 1–12*

    ☐ ☐

☐   College undergraduate years (freshman to senior)
☐   Graduate or professional school beyond a bachelor's degree (*for example: MA or PhD program, or medical or law school*)

SOURCE: See http://www.census.gov/acs/www/Downloads/questionnaires/2009/ Quest09/pdf.

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household's actual circumstances, the household may, in conjunction with LEA officials, project its annual rate of income based on the guidelines given on special situations.

In the same document, FNS provides the more detailed definition of income shown in Box B-4.

The ACS collects data on the gross money income for household members aged 15 and older, so an economic unit's income can be compared with 130 percent and 185 percent of the applicable poverty guideline to determine the economic unit's income eligibility status. In particular, the ACS collects the income categories shown in Box B-5 for each person 15 years of age and older.

The school meals and ACS income definitions appear to be very close, both specifically mentioning most of the same sources of income. There are a few minor differences. For example: *strike benefits and workers compensation* are not specifically mentioned in ACS questions, although they could be included under "any other sources of income"; *railroad retirement* is not specifically mentioned in the school meals definition,

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**BOX B-2
ACS Questions on Achievement**

**11. What is the highest degree or level of school this person has COM-
PLETED?** *Mark (X) ONE box. If currently enrolled, mark the previous grade or
highest degree received.*

NO SCHOOLING COMPLETED
☐ No schooling completed

NURSERY OR PRESCHOOL THROUGH GRADE 12
☐ Nursery school
☐ Kindergarten
☐ Grade 1 through 11—*Specify grade 1–11*

☐☐

☐ 12th grade–**NO DIPLOMA**

HIGH SCHOOL GRADUATE
☐ Regular high school diploma
☐ GED or alternative credential

COLLEGE OR SOME COLLEGE
☐ Some college credit, but less than 1 year of college credit
☐ 1 or more years of college credit, no degree
☐ Associate's degree (*for example: AA, AS*)
☐ Bachelor's degree (*for example: BA, BS*)

AFTER BACHELOR'S DEGREE
☐ Master's degree (*for example: MA, MS, MEng, MEd, MSW, MBA*)
☐ Professional degree beyond a bachelor's degree (*for example: MD, DDS,
    DVM, LLB, JD*)
☐ Doctorate degree (*for example: PhD, EdD*)

SOURCE: See http:/www.census.gov/acs/www/downloads/questionnaires/2009/
Quest09.pdf.

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but is most likely reported under "retirement income"; *annuities* are not
specifically mentioned in ACS questions, although they are likely to be
included under "retirement, survivor, or disability pensions"; *investment
income* is not specifically mentioned in ACS questions, although it could
be included under income question items "interest, dividends, etc." or
"any other sources of income"; *any other money that may be available to pay
for children's meals* and *regular contributions from persons not living in house-*

BOX B-3
ACS Question on Age

4. What is this person's age and what is this person's date of birth?
Please report babies as age 0 when the child is less than 1 year old.
Print numbers in boxes.

Age (in years)   Month   Day   Year of birth

☐☐☐   ☐☐   ☐☐   ☐☐☐☐

SOURCE: See http:/www.census.gov/acs/www/Downloads/questionnaires/2009/
Quest09/pdf.

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hold are not specifically mentioned in ACS questions, although they could be included under "any other sources of income"; and *cash withdrawn from savings* is not specifically mentioned in ACS questions and is not traditionally considered to be "income."

The panel concluded that the ACS and school meals definitions of income are sufficiently close that the ACS income definition is suitable for estimating income eligibility for the school meals programs. Nonetheless, it is important to understand the time periods to which ACS income data pertain.

The income data collected during an ACS calendar year reflect income received over 2 calendar years. For each person aged 15 and older, the ACS asks the amount of income received in the last 12 months. Consequently, an interview in January 2008 obtains income data for January 2007 through December 2007, while an interview in December 2008 obtains income for December 2007 through November 2008. The Census Bureau adjusts the income responses using a Consumer Price Index (CPI) price adjustment to reflect differences in consumer prices between the 12-month period covered by the income questions and the calendar year of the interviews.[5] The resulting annual income measure appears to be com-

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[5]The following is the Census Bureau's description of its adjustments to income:

Adjusting Income for Inflation—Income components were reported for the 12 months preceding the interview month. Monthly Consumer Price Indices (CPI) factors were used to inflation-adjust these components to a reference calendar year (January through December). For example, a household interviewed in March 2008 reports their income for March 2007 through February 2008. Their income is adjusted to the 2008 reference calendar year by multiplying their reported income by 2008 average annual CPI (January-December 2008) and then dividing by the average CPI for March 2007-February 2008. In order to inflate income amounts from previous years, the

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**BOX B-4
Income as Defined by FNS "Eligibility
Manual for School Meals"**

Income is any money received on a recurring basis, including gross earned income, unless specifically excluded by statute. Gross earned income means all money earned before such deductions as income taxes, employee's social security taxes, insurance premiums, and bonds. Income includes but is not limited to:

- Earnings from work
  — Wages, salaries, tips, commissions
  — Net income from self-employed business and farms
  — Strike benefits, unemployment compensation, and workers compensation

- Welfare/child support/alimony
  — Public assistance payments/welfare payments (TANF, General Assistance, General Relief, etc.)
  — Alimony or child support payments

- Retirement/disability payments
  — Pensions, retirement income, veteran's benefits
  — Social security
  — Supplemental security income
  — Disability benefits

- Any other income
  — Net rental income, annuities, net royalties
  — Interest; dividend income
  — Cash withdrawn from savings; income from estates, trusts, and/or investments
  — Regular contributions from persons not living in the household
  — Any other money that may be available to pay for the child(ren)'s meals.

SOURCE: U.S. Department of Agriculture/Food and Nutrition Service (2011b:39).

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parable to the Current Population Survey measure (income for the prior calendar year) that is used to determine official poverty rates (Czajka

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dollar values on individual records are inflated to the latest year's dollar values by multiplying by a factor equal to the average annual CPI-U-RS factor for the current year, divided by the average annual CPI-U-RS factor for the earlier/earliest year.

See http://www.census.gov/acs/www/Downloads/2008/usedata/2008%20ACS%20 Subject%20Definitions.pdf; http://www.census.gov/hhes/www/poverty/altpovest03/ cpi_u_cpi_u_rs.html; and http://www.bls.gov/cpi/cpirsdc.htm.

and Denmead, 2008). However, because the incomes collected in the ACS reflect an average of incomes received over a 2-year period, estimates from the ACS will not be as responsive to changes in economic conditions as estimates from surveys whose time frame covers a single calendar year, such as the Current Population Survey. The panel was charged with using the ACS to measure eligibility for school meals for schools, groups of schools, and school districts. For small geographic areas the only available estimates will be from the 5-year ACS. Combining the data from multiple ACS years will further smooth the income data. Consequently, when economic conditions are deteriorating, any ACS estimate will likely understate eligibility, while in periods of recovery, any ACS estimate will likely overstate eligibility. This will be more even pronounced for the 3-year and 5-year ACS estimates than for the 1-year ACS estimates.

In the school meals programs, the income information currently used to determine eligibility is reported on applications submitted to school districts. The prototype form provided on the FNS website[6] gives the following instructions: "For each household member, list each type of income received for the month. You must tell us how often the money is received—weekly, every other week, twice a month, or monthly. For earnings, be sure to list the gross income, not the take-home pay. Gross income is the amount earned *before* taxes and other deductions." While FNS guidelines provide flexibility in reporting of income, the data received tend to represent monthly (or more frequent), rather than annual income.[7] Using annual income from the ACS to determine eligibility averages over monthly income fluctuations is likely to indicate as ineligible some students who would be eligible for free or reduced-price meals based on monthly income values (U.S. Census Bureau, 1998). The cumulative nature of eligibility for the school meals programs contributes to the understatement of eligibility if annual income is used. Once a student has been determined to be eligible in a month, the eligibility determination remains in force for the rest of the school year and for the first month of the following school year, when another eligibility determination is made. Further, if its financial situation changes a household can apply for benefits at any time. The issue of monthly versus annual income is an important one and is addressed in Appendix G.

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[6]The prototype application form is available at http://www.fns.usda.gov/cnd/FRP/frp. process.htm.

[7]Even though FNS Headquarters has no data on this, one knowledgeable person in the agency stated that "having reviewed roughly 2,500 applications in each of the past 5 years, I would say that for the most part, households are providing income data on a weekly basis, biweekly basis, or bimonthly basis. There are some school districts that require the households to provide monthly household income data on the applications. Very few applications provide annual data (farming households in the Midwest, etc.)."

BOX B-5
ACS Questions About Income

47. INCOME IN THE PAST 12 MONTHS

Mark (X) the "Yes" box for each type of income this person received, and give your best estimate of the TOTAL AMOUNT during the PAST 12 MONTHS. (NOTE: The "past 12 months" is the period from today's date one year ago up through today.)

Mark (X) the "No" box to show types of income NOT received.

If net income was a loss, mark the "Loss" box to the right of the dollar amount.

For income received jointly, report the appropriate share for each person, or if that's not possible, report the whole amount for only one person and mark the "No" box for the other person.

a. Wages, salary, commissions, bonuses, or tips from all jobs. *Report amount before deductions for taxes, bonds, dues, or other items.*

☐ Yes → $ ☐☐☐☐☐☐.00
☐ No
        TOTAL AMOUNT for past 12 months

b. Self-employment income from own nonfarm businesses or farm businesses, including proprietorships and partnerships. *Report NET income after business expenses.*

☐ Yes → $ ☐☐☐☐☐☐.00   ☐ **Loss**
☐ No
        TOTAL AMOUNT for past 12 months

c. Interest, dividends, net rental income, royalty income, or income from estates and trusts. *Report even small amounts credited to an account.*

☐ Yes → $ ☐☐☐☐☐☐.00   ☐ **Loss**
☐ No
        TOTAL AMOUNT for past 12 months

d. Social Security or Railroad Retirement.

☐ Yes → $ ☐☐☐☐☐.00
☐ No
     TOTAL AMOUNT for past 12 months

e. Supplemental Security Income (SSI).

☐ Yes → $ ☐☐☐☐☐.00
☐ No
     TOTAL AMOUNT for past 12 months

f. Any public assistance or welfare payments from the state or local welfare office.

☐ Yes → $ ☐☐☐☐☐.00
☐ No
     TOTAL AMOUNT for past 12 months

g. Retirement, survivor, or disability pensions. *Do NOT include Social Security.*

☐ Yes → $ ☐☐☐☐☐☐.00
☐ No
     TOTAL AMOUNT for past 12 months

h. Any other sources of income received regularly such as Veterans' (VA) payments, unemployment compensation, child support, or alimony. *Do NOT include lump sum payments such as money from an inheritance or the sale of a home.*

☐ Yes → $ ☐☐☐☐☐☐.00
☐ No
     TOTAL AMOUNT for past 12 months

48. What was this person's total income during the PAST 12 MONTHS? *Add entries in questions 47a to 47h; subtract any losses. If net income was a loss, enter the amount and mark (X) the "Loss" box next to the dollar amount.*

☐ None OR $ ☐☐☐☐☐☐☐.00   ☐ **Loss**

     TOTAL AMOUNT for past 12 months

DEFINING ECONOMIC UNITS

Household composition for the purpose of making an eligibility determination for free and reduced priced benefits is based on economic units. An economic unit is a group of related or unrelated individuals who are not residents of an institution or boarding house but who are living as one economic unit, and who share housing and/or significant income and expenses of its members. Generally, individuals residing in the same house are an economic unit. However, more than one economic unit may reside together in the same house. Separate economic units in the same house are characterized by prorating expenses and economic independence from each other.[8]

A broader—and apparently inconsistent—definition of the economic unit comes from FNS guidance[9] to local school meals programs regarding the development of their application materials. Item #11 of the generic "Letter to Households" says: "Who should I include as members of my household?" The answer is: "You must include all people living in your household, related or not (such as grandparents, other relatives, or friends). You must include yourself and all children living with you." Applicants are later instructed to list all household members and each type of income for each household member. This definition of the economic unit does not explicitly raise the possibility of multiple units living within the household and is consistent with the Census Bureau's definition of households—all persons living in the same residence.

While the application instructions do not mention "economic units," knowledgeable individuals who attended panel meetings noted that if applicants for the school meals programs believe there are multiple economic units in their household, they can make that argument with local school meals officials.[10] Some panel members wondered whether such beliefs might be reflected on the submitted applications, with some families not including the income of persons who live in the same housing unit but whom they consider not to be part of their household. If an excluded person has more income than the decrement to the poverty guideline, excluding that person from the economic unit increases the

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[8]*Eligibility Manual for School Meals*, U.S. Department of Agriculture/Food and Nutrition Service (2011:37).

[9]See http://www.fns.usda.gov/cnd/frp/2010_application.doc.

[10]Taeuber and colleagues (2004) report on a match study of 2001 American Community Survey/Supplemental Survey (ACS/SS01) respondents and others in their households to individual administrative Supplemental Nutrition Assistance Program (SNAP) records from the state of Maryland. Eight percent of the difference between the ACS estimate and state data was due to multiple SNAP assistance units residing in the same ACS household. This is evidence that an ACS household sometimes contains multiple economic units according to SNAP definitions.

likelihood that the economic unit will be determined eligible for free or reduced-price meals. The difference between the two FNS definitions of household led to considerable discussion among panel members. Should the panel attempt to evaluate eligibility based on an "economic unit," as defined in the *Eligibility Manual for School Meals*, U.S. Department of Agriculture/Food and Nutrition Service (2011:37) or should we use the broader household definition embedded in the application instructions? The panel concluded that we should do our best to evaluate eligibility based on an economic unit.

For purposes of determining which persons in the household are sharing resources and which are economically independent of other household members, the most relevant information available from the ACS consists of the answers to the questions: "How many people are living or staying at this address?" and "How is each person related to Person 1?"[11] Box B-6 presents the ACS question on relationship and its possible responses. Possible responses for *related* individuals include husband or wife, biological son or daughter, adopted son or daughter, stepson or stepdaughter, brother or sister, father or mother, grandchild, parent-in-law, son-in-law or daughter-in law, and other relative. Possible responses for *unrelated* individuals include roomer or boarder, housemate or roommate, unmarried partner, foster child, and other nonrelative. The Census Bureau defines all related individuals as a *family*, and all persons who live in the housing unit as a *household*.[12] "Person 1" is typically referred to as the "householder."

The ACS does not collect information on sharing of resources and expenses that can be used to distinguish separate economic units within a household. While being related to the householder does not necessarily imply a sharing of economic resources, the panel chose to make this inference as a first step. Consequently, all persons who were related to the householder (members of the family) were assumed to be members of the same economic unit. The remaining question for the panel was whether to assign unrelated individuals, particularly unmarried partners of the householder and unrelated children, to this economic unit or to other economic units within the household.

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[11] ACS instructions define "Person 1" to be the person living or staying in the house or apartment in whose name the house or apartment is owned, being bought, or rented. If there is no such person, the person filling out the form is instructed to start with the name of any adult living or staying in the house or apartment.

[12] The panel uses the Census Bureau's definitions of family and household because we are using ACS data. However, the Census Bureau's definitions are not uniformly adopted. For example, according to the Code of Federal Regulations for Agriculture, 7 CFR 245.2: "245.2(b) Family means a group of related or nonrelated individuals, who are not residents of an institution or boarding house, but who are living as an economic unit"; and "245.2(d) Household means family as defined in 245.2(b)."

BOX B-6
ACS Question About Relationship to Respondent

2. How is this person related to Person 1? *Mark (X) ONE box.*

☐   Husband or wife
☐   Biological son or daughter
☐   Adopted son or daughter
☐   Stepson or stepdaughter
☐   Brother or sister
☐   Father or mother
☐   Grandchild
☐   Parent-in-law
☐   Son-in-law or daughter-in-law
☐   Other relative
☐   Roomer or boarder
☐   Housemate or roommate
☐   Unmarried partner
☐   Foster child
☐   Other nonrelative

SOURCE: See http:/www.census.gov/acs/www/Downloads/questionnaires/2009/
Quest09.pdf.

The Healthy, Hunger-Free Kids Act of 2010 defines foster children whose care and placement are the responsibility of an agency that administers a State Plan or whom a court has placed with a caretaker household to be categorically eligible for school meals. Accordingly, the panel counted all foster children as eligible for free meals in the school meals programs and did not count them among the members of the foster household.[13]

The panel also chose to include an individual reported as an "unmarried partner" as a member of the economic unit consisting of individuals related to the householder.[14] Although an individual declared to be the

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[13]Excluding foster children from a household when determining eligibility was consistent with guidelines in place at the time the panel developed its specifications. Under U.S. Department of Agriculture/Food and Nutrition Service (2011b) foster children are to be counted as part of the household when determining eligibility for other household children.

[14]Counting of unmarried partners as part of the nuclear family was recommended by the National Research Council (1995) and was implemented in the Supplemental Poverty Measures developed as a result of that report.

householder's partner would not be related by blood or marriage to the other members of the primary family, the panel believed that such an individual would be sharing resources with the family and decided to designate the family plus unmarried partner as the "core family." It should be noted that not all unmarried partners in the household would be identified by the ACS question, only an individual who is an unmarried partner of the householder. An example is the situation in which the householder's daughter and grandchild and the daughter's unmarried partner live in the same house with the daughter's parents. The daughter's partner would be identified as an "other nonrelative" and would not be included in the core family.

Further complications arise from the lack of information on how unrelated individuals, particularly children, are related to others in the household. For example, if the household includes an unmarried partner and a child who is classified as an "other nonrelative," should the child be assumed to be the child of the unmarried partner and consequently also included in the economic unit of the householder? If there are no other unrelated adults in the household, it is probably reasonable to conclude that both the unmarried partner and the child should be included in the core family. However, if other unrelated adults are present in the household, might one of them be the child's parent?

Because there is no perfect solution to the identification of economic units, the panel decided to examine the sensitivity of eligibility estimates to alternative assignment strategies. To this end, we prepared a number of tabulations from the 2008 ACS Public Use Microdata Sample (PUMS) files. The tables presented below illustrate characteristics of the student population and the differences in eligibility estimates that arise from different definitions of economic unit.

According to Table B-1, most of the students in the United States (97.9 percent) live in households (not group quarters) and are related to the householder. Only about 1.5 percent of students are not related to the householder and are not foster children. Foster children make up only .3 percent of the student population, as do students living in group quarters.

Table B-2 shows estimates of eligibility for school meals for related children in the United States based on the addition of various types of "unrelated people" to the economic unit that includes the core family. The table shows only estimates for related students to illustrate the impact of various definitions of the primary economic unit on eligibility for the same group of students.

For related children, the definition of the economic unit does not have a substantial impact on eligibility, although eligibility for free meals tends to decrease slightly as more individuals are included in the economic unit.

TABLE B-1 Percentage of Total Students in the United States by Group (related, unrelated, foster, and group quarters)

	Related Students*	Unrelated Students	Foster Students	Group Quarters Students
Percentage	97.9	1.5	.3	.3

*Excludes foster and group quarters students.
SOURCE: Prepared by the panel using 2008 ACS Public Use Microdata Sample (PUMS) data.

TABLE B-2 Percentage of Related Students Income-Eligible for School Meals by Economic Unit

Category	Family (%)	Family Plus Partner (%)	Family, Partner, Other Nonrelatives (%)	Family and All but Boarders (%)	Household (%)
Free	24.0	22.9	22.8	22.6	22.6
Reduced Price	11.7	11.7	11.7	11.7	11.7
Full Price	64.4	65.5	65.6	65.7	65.8

NOTE: Excludes unrelated, foster, and group quarters children. Also excludes unmarried partners who are students.
SOURCE: Prepared by the panel using 2008 ACS Public Use Microdata Sample (PUMS) data.

The percentage eligible for free meals decreases by 1.4 percentage points as the size of the economic unit increases from family to household. There is essentially no change in the percentage eligible for reduced-price meals.

Tables B-3 and B-4 illustrate characteristics of unrelated students. Table B-3 shows the relationships to the householder reported for unrelated students in the United States on the ACS. More than 83 percent of unrelated students are reported as "other nonrelatives." Table B-4 describes the living arrangements of unrelated students (who are not unmarried partners) in the United States. About 70 percent (20.7 percent + 49.5 percent) of unrelated children live in households with no unrelated adults,[15] except perhaps for an unmarried partner. On the other hand, 26.2 percent live in households with unrelated adults and no unmarried partner, while only 3.7 percent live in a household with both an unmarried partner and other unrelated adults.

This analysis led the panel to conduct a sensitivity analysis to examine the effect of the definition of economic unit using five alternative constructions of economic unit within a household. Because foster children

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[15]For purposes of these tabulations, an adult is an individual of at least age 20.

TABLE B-3 Relationships Reported for Students Who Are Not Related to the Householder

	No. of Unrelated Students*	Unmarried Partner (%)	Roomer or Boarder (%)	Roommate or Housemate (%)	Other Nonrelative (%)
United States	725,669	5.2	7.4	4.1	83.4

*Excludes foster and group quarters students.
SOURCE: Prepared by the panel using 2008 ACS Public Use Microdata Sample (PUMS) data.

TABLE B-4 Household Composition of Unrelated Students Who Are Not Unmarried Partners

	No. of Unrelated Students*	No Unmarried Partner, No Unrelated Adult (%)	With Unmarried Partner, No Other Unrelated Adult (%)	No Unmarried Partner, with Unrelated Adult (%)	With Unmarried Partner, with Unrelated Adult (%)
United States	687,743	20.7	49.5	26.2	3.7

NOTE: An "adult" is a person aged 20 and older.
*Excludes foster and group quarters students.
SOURCE: Prepared by the panel using 2008 ACS Public Use Microdata Sample (PUMS) data.

are considered separate economic units of size one, they were removed from the rest of the household prior to the analysis.[16] The five definitions described in Table B-5 and Box B-7 reflect different ways of splitting household members into three types of economic units: the primary economic unit that includes the core family, a secondary economic unit consisting of unrelated individuals, and/or assignment of unrelated individuals to economic units of size one. Table B-5 shows how the five economic unit definitions—denoted by EU1, EU2, . . ., EU5—impact unrelated students in the household.

Under the first two definitions, EU1 and EU2, the primary economic unit consists only of the core family. Under EU3 and EU4, the primary economic unit consists of the core family plus any unrelated children in households that have no unrelated adults and only the core family in

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[16]As noted previously, this was consistent with guidelines in place at the time the panel developed specifications. According to the U.S. Department of Agriculture/Food and Nutrition Service (2011b), foster children are to be counted as part of the household when determining eligibility for other household children.

TABLE B-5 Assignment of Unrelated Students Who Are Not Unmarried Partners to Economic Units for Sensitivity Analysis

	No Unmarried Partner, No Unrelated Adult (%)	With Unmarried Partner, No Other Unrelated Adult (%)	No Unmarried Partner, with Unrelated Adult (%)	With Unmarried Partner, with Unrelated Adult (%)
Percentage of Unrelated Students	20.7	49.5	26.2	3.7
EU1	One	One	One	One
EU2	Secondary	Secondary	Secondary	Secondary
EU3	Primary	Primary	One	One
EU4	Primary	Primary	Secondary	Secondary
EU5	Primary	Primary	Primary	Primary

NOTES: Excludes foster and group quarters students. **Primary** means these students are part of the primary economic unit that includes the core family; **one** means each student is an economic unit of size one; **secondary** means these students are part of an independent secondary economic unit of unrelated individuals in the household; and an **adult** is a person aged 20 and older.
SOURCE: Prepared by the panel using 2008 ACS Public Use Microdata Sample (PUMS) data.

households that have other unrelated adults. Under EU5, the primary economic unit consists of all household members (except foster children). EU2 and EU4 consist of a single secondary economic unit made up of all unrelated household members (except foster children). With EU1 and EU3, all unrelated individuals who are not part of the primary economic unit are assumed to be economic units of size one; if they are children, these individuals are assumed to be eligible for free meals. In some households, the only unrelated individuals are children. In EU2, these unrelated children form a separate secondary economic unit, while in EU4 they become part of the primary economic unit.

The definitions EU1 and EU2 represent extreme assumptions about economic sharing among individuals who are unrelated to the householder. EU1 assumes that unrelated persons are economically independent of the householder's economic unit and of each other, while EU2 assumes that all unrelated individuals are independent of the householder's economic unit but should be considered as one separate independent secondary economic unit. Compared with EU1, EU2 can be expected to lead to lower estimates of eligibility for free and reduced-price meals as the income of unrelated adults is counted in determining the eligibility of unrelated children.

The next two definitions provide a more sophisticated assignment of unrelated children. As previously noted, the presence of an unmarried

BOX B-7
Definition of Economic Units for Sensitivity Analysis

Foster children are removed from a household before the definitions of economic units described below are applied. Instead foster children are considered separate economic units of size one.

EU1: The "core" family (defined as all related individuals plus an unmarried partner of the householder) is one economic unit. All other unrelated individuals are separate economic units of size one. Since the unrelated students tend to have little income, they are all assigned—for simplicity—as eligible for free meals.

EU2: The core family is one economic unit. All other unrelated individuals in a household are considered to be a separate economic unit.

> Note that for EU1 and EU2, no unrelated persons, except for unmarried partners, are added to the economic unit of the core family (family plus unmarried partner). EU1 and EU2 reflect different ways of treating the unrelated individuals.

EU3: If there are no unrelated adults (except an unmarried partner of the householder) any unrelated students (plus any other unrelated children who are not students) are combined with the core family as one economic unit. (For these households, the economic unit is the household.) If there are unrelated adults (roomers/boarders, roommates/housemates, or other nonrelatives), each unrelated individual (except an unmarried partner) is considered to be a separate economic unit of size one. Since students tend to have little income, they are all assigned—for simplicity—as eligible for free meals.

EU4: If there are no unrelated adults (except an unmarried partner), any unrelated students (plus any other unrelated children who are not students) are combined with the core family as one economic unit. (For these households, the economic unit is the household.) If there are unrelated adults (in addition to an unmarried partner), all unrelated individuals (except an unmarried partner) are combined into a separate economic unit.

> EU3 and EU4 expand the economic unit that is based on the core family by adding any unrelated children if no other unrelated adults besides an unmarried partner are present. Thus, 70 percent of the unrelated students become part of the economic unit of the core family. This approach appears to be consistent with Food and Nutrition Service's (FNS) definitions that ask applicants to "include all children living with you." EU3 and EU4 reflect different ways of treating the unrelated children that live in households with other unrelated adults. EU3 makes all such children eligible for free meals, and EU4 makes them part of a separate economic unit that includes all unrelated individuals.

EU5: The economic unit is the household.

> EU5 is at one extreme: all people who live in the housing unit are included in the economic unit.

SOURCE: Prepared by the panel.

partner without any other unrelated adults is a likely indicator that any unrelated children belong to the unmarried partner and consequently should be assigned to the primary economic unit with the unmarried partner. Likewise, if no unrelated adults are present in the household but unrelated children (other than foster children) are, the panel believed that it would be reasonable to assume that these children are economically dependent on the householder and should be included in the primary economic unit. The only difference between EU3 and EU4 is the assignment of unrelated children when there are unrelated adults other than an unmarried partner in the household. EU3 places all such unrelated children in separate economic units of size one, while EU4 places all unrelated individuals in such households in a separate secondary economic unit independent of the householder's economic unit. EU5 considers all residents of the household, both related and unrelated, as a single economic unit.

Table B-6 displays national estimates of eligibility obtained under the five alternative definitions of economic unit for all unrelated children (excluding foster children), related children, and all students including foster children. This table does not include students living in group quarters.

While the alternative economic unit definitions have a substantial impact on the eligibility distribution for unrelated children (excluding foster children), the impact on the eligibility status of the total population of students is quite small. The fraction of students eligible for free or reduced-price meals decreases just slightly at every step from EU1 to EU5. In particular, in moving from EU4 to EU5, the percentage eligible for free or reduced-price meals declines by approximately .5 percentage points. Based on these findings, the panel concluded that any judgment we would make about how to define an economic unit would likely have only a small impact at the national level.

CATEGORICAL ELIGIBILITY

Income eligibility is not the sole means by which individual students can qualify for free school meals. If a household participates in the Supplemental Nutrition Assistance Program (SNAP, formerly the Food Stamp Program), Temporary Assistance for Needy Families (TANF), or the Food Distribution Program on Indian Reservations (FDPIR), a student in that household is categorically eligible for free meals. In the estimates discussed to this point, eligibility is determined based solely on income. This section examines how categorical eligibility increases the estimated rate of eligibility for free and reduced-price meals for school children. Students are categorically eligible for free meals if someone in the family

TABLE B-6 Income Eligibility Distribution of Public School Students in the United States: Groups of Students and Economic Units

Number of Students by Relationship	Category	Percentage of Students Eligible by Category and Relationship				
		EU1 (%)	EU2 (%)	EU3 (%)	EU4 (%)	EU5 (%)
Unrelated	Free	100.0	85.2	42.6	24.7	18.4
687,743	Reduced price	0.0	5.7	8.9	12.5	12.9
	Full price	0.0	9.1	48.5	62.8	68.7
Related	Free	22.9	22.9	22.9	22.9	22.6
47,714,172	Reduced price	11.7	11.7	11.7	11.7	11.7
	Full price	65.4	65.4	65.4	65.4	65.7
Related, Unrelated, and	Free	24.2	24.0	23.4	23.2	22.8
Foster	Reduced price	11.5	11.6	11.6	11.7	11.7
48,568,936	Full price	64.3	64.4	65.0	65.1	65.6

NOTE: Group quarters students not included.
SOURCE: Prepared by the panel using 2008 ACS Public Use Microdata Sample (PUMS) data.

participates in certain means-tested public assistance programs targeting the low-income population. Specifically, students are categorically eligible for free meals if their families receive assistance from SNAP, TANF, or FDPIR. A student also is categorically eligible if a family member is enrolled in a Head Start or Even Start Program (based on meeting that program's low-income criteria) or the student is (1) a homeless child as determined by the school district's homeless liaison or by the director of a homeless shelter, (2) a migrant child as determined by the state or local Migrant Education Program coordinator, or (3) a runaway child who is receiving assistance from a program under the Runaway and Homeless Youth Act and is identified by the local education liaison.[17] These definitions include students who live in households and students who may not live in typical housing units (migrant, runaway, and homeless children).

For children in households, the ACS collects information about the receipt of SNAP benefits and the receipt of public assistance income. For SNAP, the respondent reports whether any person in the household receives benefits. Public assistance income data are collected as item 47f in the income questions completed for each person in the household aged 15 and older. Specifically, the respondent is asked to report "the amount of

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[17]*Eligibility Manual for School Meals,* U.S. Department of Agriculture/Food and Nutrition Service (2011:48).

any public assistance or welfare payments from the state or local welfare office." Although such an amount might include cash assistance from TANF, which confers eligibility, it might also include payments from programs that do not confer eligibility. The ACS questions about benefit receipt are shown in Box B-8.

While the ACS cannot be used to identify all types of categorical eligibility, it can be used to identify the ones that affect the greatest number of children: SNAP and TANF. One challenge in using the ACS data on benefit receipt to measure categorical eligibility, however, is reporting error that tends to understate benefit receipt.[18] A match study of ACS with administrative data from Maryland's Client Automated Resource and Eligibility System, the administrative record system for the state of Maryland, showed that many ACS respondents do not report the benefits that they actually receive.[19]

ACS data can be used to identify (at least some) students who are categorically eligible for school meals because someone in the household receives SNAP benefits, or if someone in the economic unit receives public assistance income. While the latter might include income from programs that do not provide categorical eligibility (hence over-counting eligibility), TANF, too, suffers from underreporting of benefits on the ACS.[20] Meyer, Mok, and Sullivan (2009) showed that in 2004, the most recent year for which they had data, administrative TANF dollar amounts

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[18]Czajka and Denmead (2008:170) report, "As a rule surveys underreport numbers of participants in means tested programs, so in comparing estimates of participation across surveys, more is generally better." Of the surveys they examined, the Survey of Income and Program Participation (SIPP) has the highest number, 31.4 million people (or 11.2 percent of the population), in families receiving welfare or food stamps at any time during 2002. The ACS is second with 24.5 million people or 8.8 percent of the population.

[19]Taeuber and colleagues (2004) report that the published (weighted) ACS/SS01 estimate for number of households receiving SNAP benefits was 87,429 in 2000/2001, while state records showed a total of 157,857 households receiving SNAP benefits. This study matched ACS respondents and others in their household with individual administrative SNAP records from Maryland. A careful study of the discrepancy showed that 68 percent was due to underreporting of SNAP benefits on ACS from individuals who were receiving such benefits, 6 percent was due to individuals living in group quarters (not covered by ACS at the time), 8 percent was due to multiple SNAP assistance units residing in the same household, and 15 percent was due to households reporting SNAP benefits when they were not on SNAP rolls in Maryland. An earlier study by Taeuber, Staveley, and Larson (2003) showed that the underreporting was greater for households that did not have children than for households with children.

[20]Lynch and colleagues (2007) matched individual ACS and TANF records for the state of Maryland. Of the 95 households in the match, 43 said "yes" to receiving public assistance and 52 said "no." This study established that 42 of the 52 households that said "no" were actually on TANF according to Maryland and failed to report those benefits on the ACS. One reason for underreporting of TANF benefits for children is that the ACS does not collect income data for children under age 15.

BOX B-8
ACS Questions Related to Categorical Eligibility

12. IN THE PAST 12 MONTHS, did anyone in this household receive Food Stamps or a Food Stamp benefit card?

☐ Yes
☐ No

47.f. Any public assistance or welfare payments from the state or local welfare office.

☐ Yes → $ ☐☐☐☐☐.00
☐ No
       TOTAL AMOUNT for past 12 months

SOURCE: See http:/www.census.gov/acs/www/Downloads/questionnaires/2009/Quest09.pdf.

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exceeded ACS reports of receipt of public assistance by 15.6 percent of total TANF receipts even though the ACS estimate includes income from other sources of public assistance.

The panel compared ACS estimates of eligibility using definitions EU4 and EU5, to evaluate the contribution of SNAP benefits and public assistance income to the percentages of children eligible for school meals. For both EU4 and EU5 Table B-7 shows eligibility percentages under four different alternatives: (1) income eligibility only, (2) income eligibility plus categorical eligibility for free meals based on receipt of SNAP benefits by anyone in the household, (3) income eligibility plus categorical eligibility for free meals based on receipt of public assistance income by anyone in the household, and (4) income eligibility plus categorical eligibility for free meals based on receipt of SNAP benefits or public assistance income by anyone in the household.

Consideration of SNAP benefits increases the percentage eligible for free meals by more than 5 percentage points under both EU4 and EU5, and accounting for both SNAP benefits and public assistance income increases the percentage eligible for free meals by about 6 percentage points. Based on our review of the eligibility rules and these findings, the panel concludes that the ACS data on SNAP benefits and public assistance income should be used in deriving estimates of eligibility because

TABLE B-7 Percentage of Students in the United States Eligible for School Meals Under Definitions EU4 and EU5

| Category | Percentage of Students Eligible by Category | | | |
	Income Eligibility Only	Income Eligibility Plus Categorical Eligibility Based on SNAP Benefits	Income Eligibility Plus Categorical Eligibility Based on Public Assistance Income	Income Eligibility Plus Categorical Eligibility Based on SNAP Benefits or Public Assistance Income
EU4				
Free	23.2	28.4	24.8	29.1
Reduced price	11.7	9.3	11.1	9.2
Full price	65.1	62.2	64.1	61.8
EU5				
Free	22.8	28.2	24.5	28.8
Reduced price	11.7	9.3	11.0	9.1
Full price	65.6	62.5	64.5	62.1

NOTES: Includes related, unrelated, and foster children; excludes group quarters children. SNAP = Supplemental Nutrition Assistance Program (formerly the Food Stamp Program). SOURCE: Prepared by the panel using 2008 ACS Public Use Microdata Sample (PUMS) data.

these variables appear to identify students who are not eligible based on ACS income alone. Although considering children in households receiving SNAP benefits and public assistance income to be eligible for free meals resulted in levels of free eligibility closer to national estimates from administrative data, the panel's primary remaining concern with this approach is that documented underreporting of SNAP benefits and public assistance income in the ACS is likely to result in an understatement of eligibility. The issue of underreporting of SNAP benefits and public assistance income in ACS is an important one and is addressed further in Appendix G.

MULTIPLE ECONOMIC UNITS AMONG RELATED INDIVIDUALS

To the extent that subfamilies (that are related to the householder) might have been considered separate economic units when they applied for school meals, pooling all related individuals into an economic unit could result in subfamily member children being less likely to be considered income eligible for school meals. The Census Bureau uses rela-

tionship data to define subfamilies in its ACS PUMS files.[21] The panel conducted a sensitivity analysis on the impact of subfamilies on eligibility for school meals. For households with subfamilies, a subfamily with children was considered a separate economic unit (although if the household was reported as participating in SNAP, the child was still considered to be categorically eligible). At the national level, the percentage eligible for free meals increased by 1.6 percentage points, all coming from the full-price category. The challenge is that in this analysis all subfamilies were considered to be separate economic units. It is more likely that only some subfamilies are actually independent economic units, and the ACS provides no information on when individuals share resources.

STATE AND DISTRICT ANALYSIS

The panel noted that at a more local level, it might be possible for the choice of approach to have a greater impact, especially in areas where the proportion of students unrelated to the householder is higher than the national proportion. Accordingly, this section examines findings at two different geographic levels—the state and the school district. The 2008 PUMS data were used for all calculations. We examined the 115 school districts whose attendance boundaries align with the boundaries of one or more Public Use Microdata Areas (PUMAs).[22]

Impact of Alternative Definitions of the Economic Unit

Figures B-1 and B-2 plot the percentage of students eligible for free and reduced-price meals by the five alternative definitions of the economic unit for states and school districts, respectively. Each state or school district is represented by a connected line whose height at each of the five definitions (on the horizontal axis) represents the percentage of students eligible for free or reduced-price meals under that definition. A perfectly horizontal line represents the case in which the economic unit definition

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[21]According to ACS PUMS definitions, "A subfamily is a married couple (husband and wife) interviewed as members of the same household with or without never-married children under 18 years of age, or one parent with one or more never married children under 18 years old. A subfamily does not maintain its own household, but lives in a household where the householder or householder's spouse is a relative." Subfamilies are defined during the processing of data. Not all analysts believe that the methods used by the Census Bureau are the best possible, but they provided a target of opportunity for this analysis. See Ruggles and Brower (2003) and Schroeder (2010).

[22]The panel was restricted to considering state and selected school districts because of the geographic information available on the public use ACS PUMS file. Hence this is not a complete analysis of the local impact on eligibility of economic unit definition.
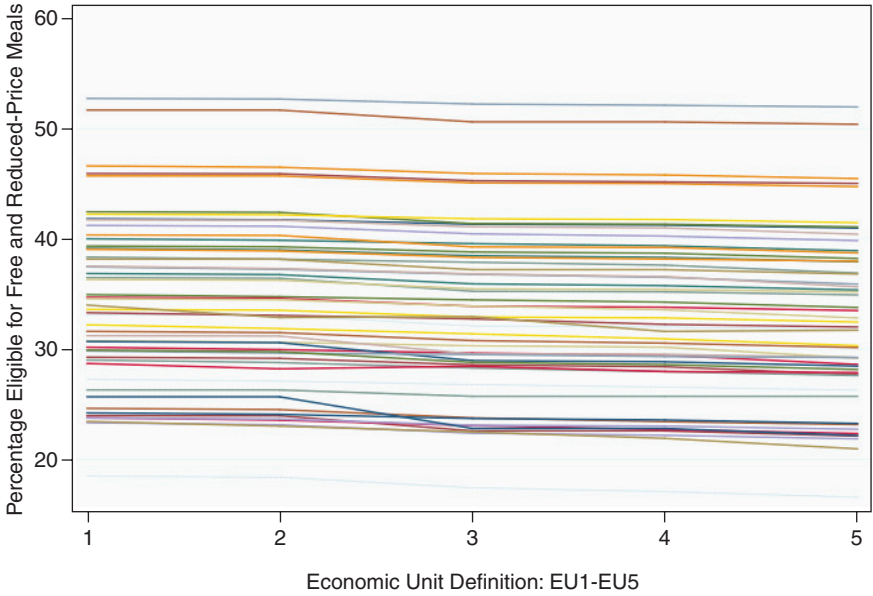
FIGURE B-1 Impact of alternative economic unit definitions by state.
SOURCE: Prepared by the panel.
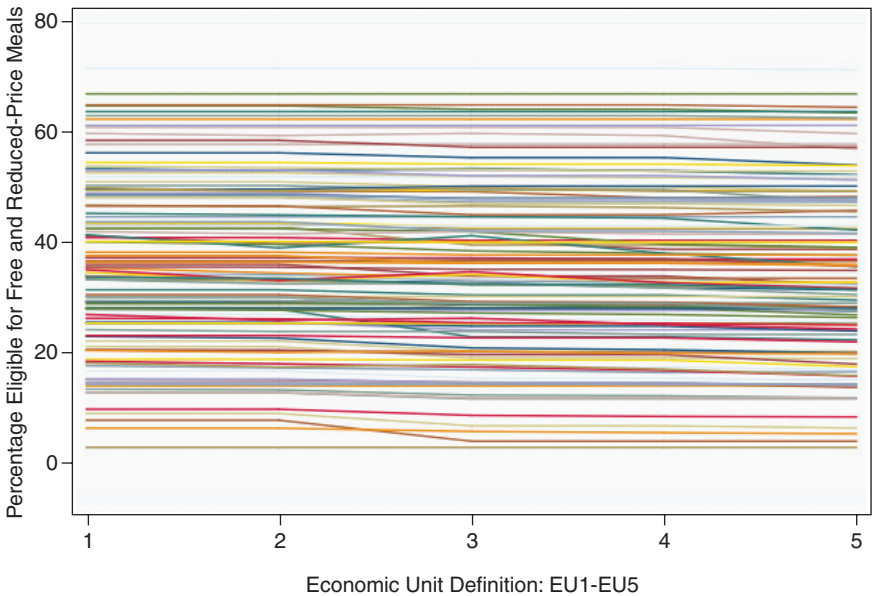
FIGURE B-2 Impact of alternative economic unit definitions by school district.
SOURCE: Prepared by the panel.

has no effect on the percentage eligible. While the lines are not perfectly horizontal, they do indicate that for these more local levels the economic unit definition has little effect on the percentage of students eligible for free or reduced-price meals.

The Impact of Allowing More Than One Economic Unit in the Household

The difference between the fourth and fifth definition of the economic unit reflects the assumption of allowing the household (less foster children) to reflect the presence of a second economic unit among unrelated individuals: EU5 defines the economic unit as the whole household, while EU4 allows for the possibility of two economic units (the family and unrelated individuals). Typically one would expect that allowing for multiple units would increase the number of students eligible for free or reduced-price meals. This effect was found when ACS estimates were analyzed at the national level, and we repeated the calculations at the state level and for the 115 school districts whose boundaries aligned with PUMAs. Figure B-3 provides box plots for the distribution of the differ-

Percentage Point Difference in Free and Reduced-Price Eligibility

| | EU4-EU5 without cat. elig. | | EU4-EU5 with cat. elig. |
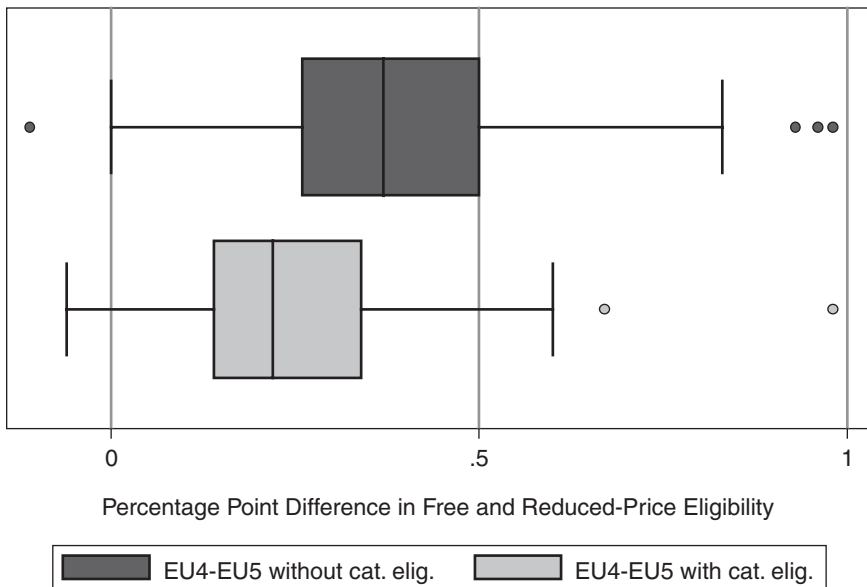
FIGURE B-3 Impact of alternative economic unit definitions on state-level eligibility (EU4-EU5) without and with categorical eligibility.
SOURCE: Prepared by the panel.

ence between the EU4 and EU5 free and reduced-price eligibility rates at the state level, both with and without accounting for categorical eligibility.

Figure B-3 shows that the difference is not always positive. In one state allowing for multiple economic units within the household lowered the eligibility rate. In all other instances, however, allowing for multiple economic units in the household increased the eligibility rate, but not by large amounts. The median increase was less than .4 percentage points without accounting for categorical eligibility and was even smaller after accounting for categorical eligibility. The increase was always less than 1 percentage point.

Figure B-4 displays the difference between EU4 and EU5 eligibility rates with and without categorical eligibility at the school district level. Again the difference is not always positive. However, allowing for multiple economic units tends to increase eligibility for free and reduced-price meals. These increases tend to be small, although in a few districts, they are more than 2 percentage points. Accounting for categorical eligibility reduces the difference in eligibility rates between EU4 and EU5.

The sensitivity analysis of multiple economic units among related individuals (the subfamily analysis) revealed that at the state level on

Percentage Point Difference in Free and Reduced-Price Eligibility

| ▬ EU4-EU5 without cat. elig. | ▭ EU4-EU5 with cat. elig. |
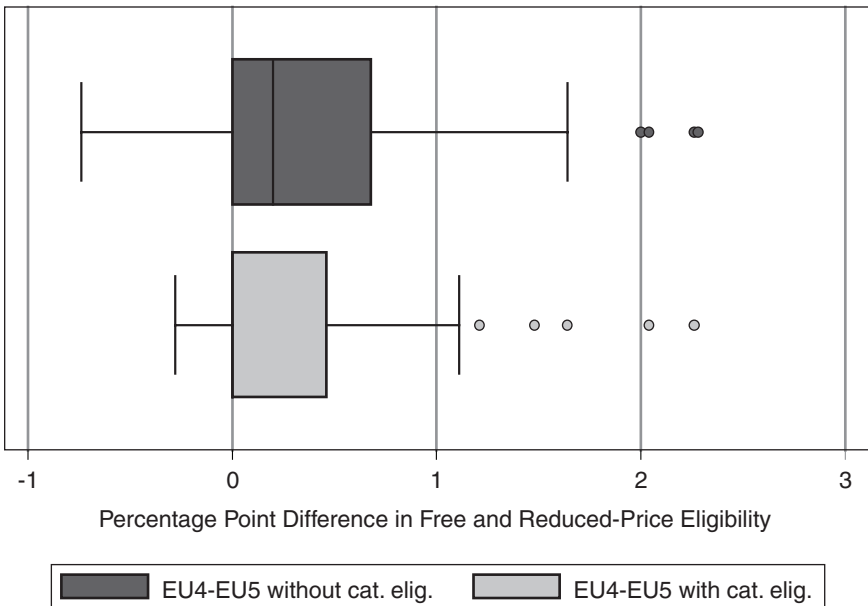
FIGURE B-4 Impact of alternative economic unit definitions on district-level eligibility (EU4-EU5) without and with categorical eligibility.
SOURCE: Prepared by the panel.

average the percentage of public school students eligible for free meals increased by 1.6 percentage points if all census-identified subfamilies are counted as separate economic units. At the school district level, the percentage eligible for free meals increases an average of 1.5 percentage points.[23] The ACS provides no information about what proportion of subfamilies are actually living as independent economic units within their households, and as a result, the above increases overstate the impact of accounting for subfamilies.

These comparisons reassured the panel that using EU4 as the definition of an economic unit for determining eligibility provides a balanced approach, and by itself would not make a large difference in eligibility. This approach avoids the assumption that there is only one economic unit in a household, which is important because evidence shows that a household can have multiple economic units. However, the approach provides for at most one economic unit among unrelated individuals and does not provide for multiple economic units among related individuals. While these situations are likely to be rare, they would tend to increase eligibility (if it were possible to account for them accurately).

STATE AND DISTRICT ANALYSIS OF CATEGORICAL ELIGIBILITY

This section examines how accounting for categorical eligibility can increase the estimated rate of eligibility for free and reduced-price meals at the state and school district levels. For both the EU4 and EU5 definitions of an economic unit, Figures B-5 and B-6 depict the box plots for the distribution of differences between eligibility rates with and without accounting for categorical eligibility at the state and school district levels, respectively

While the impact of accounting for categorical eligibility is always positive, the impact is large for some states and school districts. The median impact at the state level is about 3.2 percentage points and for school districts is slightly higher at almost 4 percentage points. As expected, the variation in impacts is much higher at the school district level.

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[23]In at least one example, eligibility went down because the student was in a subfamily, but the head of household had public assistance income that had qualified the student for categorical eligibility under EU4 or EU5.
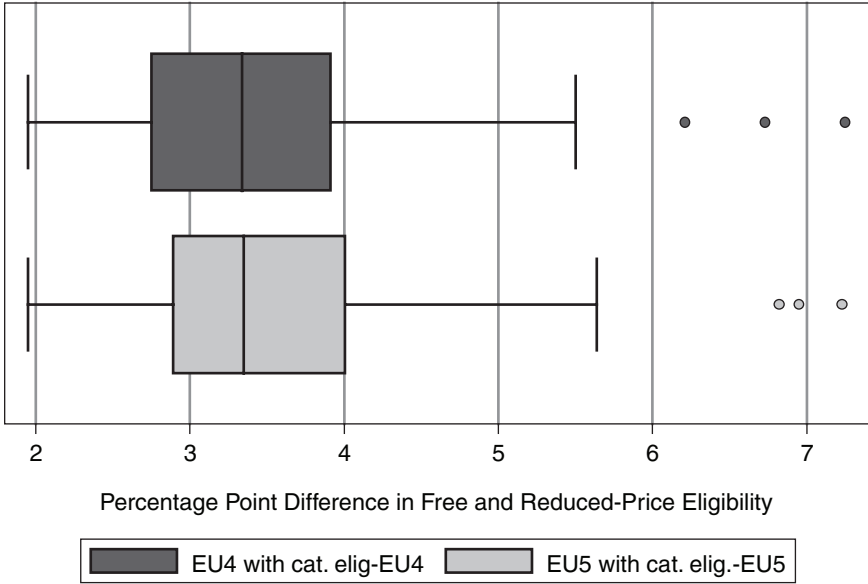
FIGURE B-5 Impact of categorical eligibility at the state level with EU4 and EU5 (EUX with categorical eligibility-EUX).
SOURCE: Prepared by the panel.
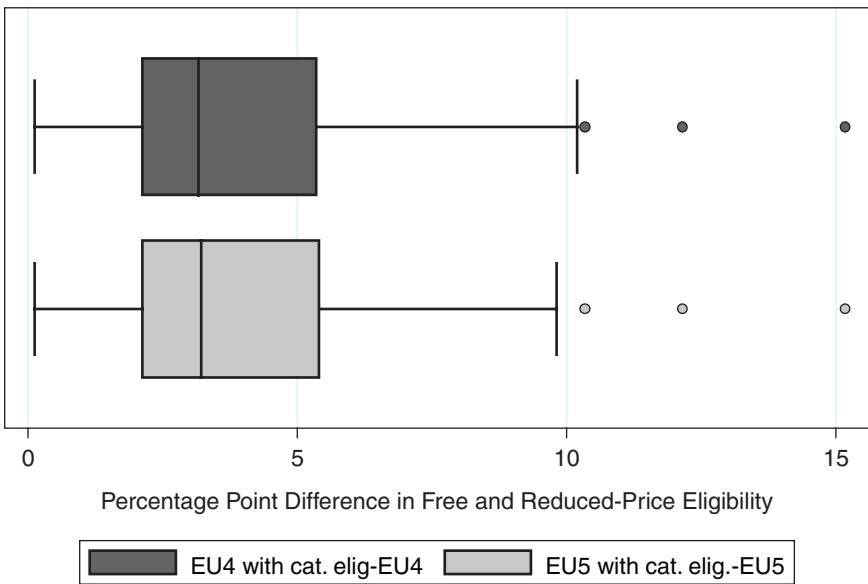
FIGURE B-6 Impact of accounting for categorical eligibility at the district level with EU4 and EU5 (EUX with categorical eligibility-EUX).
SOURCE: Prepared by the panel.

CONCLUSIONS

The panel concluded that the definition of an economic unit should allow for multiple units within a household, as provided in the *Eligibility Manual for School Meals*.[24] This judgment eliminated EU5 as our preferred definition. We further concluded that ACS variables pertaining to SNAP participation and the receipt of public assistance income should be used to account for categorical eligibility for free meals. We also concluded that if a household has no unrelated adult besides an unmarried partner, a reasonable assumption is to assign unrelated children to the primary economic unit. This judgment eliminated EU1 and EU2 as our preferred definition, leaving only EU3 and EU4. The only difference between these two measures is the treatment of unrelated children when unrelated adults other than an unmarried partner are present in the household. To assume that none of these adults is economically related to the children (EU3) did not seem to be a reasonable assumption. Consequently, the panel concluded that of the alternative definitions examined, EU4 should be adopted for determining eligibility for school meals. The panel realizes that this assignment rule is subject to potential errors. One type of error will occur when an unmarried partner and other unrelated adults are both present. EU4 will assign the unrelated children to the other unrelated adults to form a secondary economic unit when they may really be children of the unmarried partner and should be assigned to the primary family. A second type of error is the aggregation of all unrelated adults and children into a single secondary economic unit when more than one secondary unit should be formed. A third type of error is considering all related individuals in a household as members of the same economic unit. It is possible, for example, that in some households, a family may live as a separate economic unit in the same household as one set of parents.

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[24]U.S. Department of Agriculture/Food and Nutrition Service (2011:37).

Appendix C

Model-Based Estimates
for School Districts and
School Attendance Areas

For all school districts in the Census Bureau's Topologically Integrated Geographic Encoding and Referencing (TIGER) database, the Small Area Income and Poverty Estimates Program (SAIPE), operated by the Census Bureau, has been releasing annual estimates for the number of related[1] children aged 5-17 living in families with income below the poverty level since 1999.[2] Title I of the No Child Left Behind Act of 2001 directed the U.S. Department of Education to allocate $14 billion to school districts based on SAIPE results.[3]

The SAIPE model estimates are produced for a given year with about a 1-year time lag. For example, 2008 estimates were released in December 2009; they incorporated administrative records information for 2007. This schedule is only a few months later than the release of direct American Community Survey (ACS) estimates. The SAIPE model-based estimates have the advantage of reducing mean squared error compared with direct estimates for small geographic areas; however, their accuracy depends on the validity of the underlying model and may vary for different kinds of areas. SAIPE estimates are not available for census tracts or block groups, and they pertain to the official statistical poverty level and not the 130 percent and 185 percent ratios of income to the poverty level that determine

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[1]Related children are people who are aged 5-17 and related by birth, marriage, or adoption to the householder of the housing unit in which they reside; foster children, other unrelated individuals, and residents of group quarters are not considered related children.

[2]Estimates were also released in 1995 and 1997.

[3]The development of SAIPE is described in National Research Council (2000a,b).

eligibility for free and reduced-price school meals, respectively. The panel partnered with the Census Bureau to develop model-based estimates for the percentages of public school children who are eligible for free and reduced-price meals. The model was developed in a short period of time and with limited resources, and should be viewed as a proof of concept. The work on developing and evaluating the model led to the identification of research topics that could be used to improve the model in the future should resources become available.

HIGHLIGHTS OF THE SAIPE ESTIMATION PROCESS[4]

The SAIPE estimation process entails several steps. First, state-level poverty estimates are developed for ages 0-4, 5-17, 18-64, and 65 and older. There are two equations for ages 5-17—one for all children and one for related children. These estimates are based on a weighted average of a direct ACS estimate and a prediction from a regression model. The dependent variable in the model is the ACS 1-year direct estimate.[5] Independent variables include the poverty rate from the 2000 census, the tax return poverty rate, the tax return nonfiler rate, a Supplemental Nutrition Assistance Program (SNAP, formerly the Food Stamp Program) participation ratio, and the Supplemental Security Income (SSI) receipt rate. The regression-based and ACS-based estimates are combined, each being weighted according to the associated uncertainty, with the more uncertain estimate having less weight. The poverty ratios obtained are multiplied by population estimates to provide counts of the number of people in poverty, which are controlled to sum to the official national total from the ACS.

Second, county-level estimates are developed. Like the state estimates, the county estimates are based on a weighted average of direct ACS estimates and regression predictions. The dependent variable in each regression model is the log of the number of people in a particular age category in that county as measured by the ACS. Predictor variables (appropriately transformed) include the number of child exemptions claimed on tax returns of people in poverty, the number of child exemptions on tax returns, the number of SNAP benefit recipients, the resident population, and the estimated number of people in the age category in poverty according to the 2000 census. Weighting of the ACS and model estimates

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[4]This section comes from documentation on the Census Bureau's website, with some minor editing. See http://www.saipe.gov/did/www/saipe/methods/schools/data/20062008.html.

[5]ACS direct estimates are estimates produced for a population group, time frame, and geographic area based only on ACS data and the ACS methods documented by the Census Bureau.

is based on the uncertainty associated with each estimate. For counties for which there are no ACS sample observations in the age category, the weight on the model's prediction is 1. County estimates are adjusted so they sum to the state total from the previous step.

State- and county-level estimates are provided along with estimates of their uncertainty, measured as a margin of error. The margin of error is the half-width of a 90 percent confidence interval for an estimate and is equal to 1.645 times the standard error. The standard errors represent "uncertainty" arising from two major sources: ACS sampling variation and lack of fit of the regression model to what the ACS measures. In general, the former error is larger than the latter.

Finally, school district-level estimates are developed using a "shares methodology," a way of creating estimates for sub-jurisdictions from estimates for the jurisdiction. Counties are divided into school districts, parts of school districts (for districts that cross county lines), and possibly residual pieces not in any school district. The division may be done separately by grade and type of school. For the 2008 SAIPE estimates, the child poverty shares for each subcounty portion of a school district were constructed by combining the shares from two data sources—2010 decennial Census direct estimate poverty shares and child tax poverty shares. Not all tax returns can be exactly located at the subcounty level, so in areas with less reliable subcounty tax data, the SAIPE estimate relies more heavily on the decennial census share. The precise method used for combining these two shares is termed the minimum change method, Maples and Bell (2007). For each school district and school district piece, estimates are derived for the total population, children aged 5-17, and related children aged 5-17 in families in poverty. Margins of error are not currently provided for school district-level estimates, although the Census Bureau continues to conduct research on the estimation of standard errors for school district-level estimates.

The 2008 school district estimates are based on the 2008 county estimates and tabulations of poverty from the 2000 census and income tax data for tax year 2007 from the Internal Revenue Service (IRS), using school district boundaries corresponding to school year 2007-2008. By construction, the SAIPE school district estimates are arithmetically consistent with the SAIPE county and state estimates.

MODEL SPECIFICATION FOR SCHOOL MEALS PROGRAMS[6]

Census Bureau staff noted the following challenges in adapting the SAIPE-like model to produce estimates of eligibility for the school meals programs.

- To follow the log-level structure of the SAIPE model would require an estimate of the universe. In the case of the school meals programs, the universe contains children aged 0-19 *attending public school*. The only source for public school attendance consistent with Census Bureau population and survey estimates is the ACS. This source would inject additional sampling error into the estimates and suggests the possible desirability of modeling public school enrollment.

- County-level modeling of the log of survey-weighted counts causes removal of counties with zero estimates. In the 2009 ACS, about 4 percent of 3,143 counties had zero estimates of eligibility for free meals, and 21 percent had zero estimates for reduced-price meals. This demonstrates two points: (1) deleting these observations to take logs appeared to be more severe than including them in a continuous distribution rate model, and (2) work done by Elizabeth Huang and Jerry Maples of the Census Bureau indicates potential serious bias for successive difference variance estimates of log quantities with small sample sizes.

- SAIPE is designed for Title I allocations, which is a "fixed-pie" funding program; that is, the total funding for Title I is fixed so that an increase in the amount allocated to one jurisdiction entails a decrease in the amounts allocated to one or more other jurisdictions. Therefore, national consistency among the level estimates and top-down controls are important. The school meals programs are fully funded, and the target estimates are eligibility rates.

- To produce accurate (unbiased) estimates of the parameters, the Census Bureau decided to estimate the parameters at the county level, where zero eligible in a sample is less prevalent. However, since a lagged ACS survey variable was also included, the assumption of constant parameters across all sizes of districts may be untenable.

- To allow for variable parameters, separate parameter estimates were produced for each of three partitions (0-20,000 residential population, 20,000-65,000, and 65,000+). All parameters (regres-

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[6]This is an edited version of documentation provided to the panel on May 12, 2011, by the U.S. Census Bureau.

sion coefficients and model error variance) may differ from one partition to another.[7]

For the school district-level model, the Census Bureau chose a Fay-Herriot structure similar to SAIPE production, but on an unlogged rate scale[8] rather than log-levels. Parameters were estimated independently for both the free and reduced-price eligibility rates at the county level and then applied to school district-level auxiliary data. No raking to higher levels was performed.

County-Level Model

The empirical Bayes model of eligibility rates reflects the general shrinkage form suggested by Fay and Herriot (1979). The model is

$$y_i = Y_i + e_i, \text{ where } e_i \sim \text{ind } N(0, v_i) \tag{1}$$

and

$$Y_i = x_i' \beta_k + u_i \text{ where } u_i = i.i.d.N\left(0, \sigma_{\omega k}^2\right) \tag{2}$$

where for a given year and county i,

- y_i = ACS direct survey estimate of free (or reduced-price) eligibility rate;

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[7]The SAIPE county model estimates one set of parameters across all counties. For the school meals programs, the Census Bureau addressed the issues of size variation by using the size partitions associated with 1-year, 3-year, and 5-year ACS estimates. These models may or may not adequately represent school districts within a county that may be very small and have very different urban/rural or other important properties. Census Bureau analysts stated that they do not have solid evidence as to whether the quality of the estimates can be extrapolated to very small areas. They did perform residual analysis, whereby it does not appear visually that excessive outliers are present at smaller sizes, but do not have any statistical testing to report. Appropriate partitioning and evaluation for very small areas is an ongoing field of research at the Bureau. The models for the school meals programs could similarly benefit from additional research.

[8]The analysis conducted made it clear that a log transformation was not a good approach. However, no extensive specification search was performed for other transformations, and no testing for linearity of the chosen specification was conducted because of time and resource constraints. This could be a topic for further research. However, the range of estimates did not appear to be that extreme. There were outliers at 0 and 100, but excluding these, the 10th and 90th percentiles for the 2009 ACS dependent variables at the county level were 14-57 percent for free eligibility rates and 1-21 percent for reduced-price eligibility rates. Census Bureau analysts believed that one of the data characteristics driving poor fit for the reduced-price eligibility model was the limited range of the dependent variable.

- Y_i = true population value of free (or reduced-price) eligibility rate;
- $e_i = y_i - Y_i$ = sampling error in y_i as an estimate of Y_i;
- x_i = vector of regression variables (see below);
- β_k = vector of regression parameters for partition k (population size), $k = \{k_1, k_2, k_3\}$;
  - k_1 = counties with population less than 20,000;
  - k_2 = counties with population greater than or equal to 20,000 but less than 65,000; and
  - k_3 = counties with population greater than or equal to 65,000;
- u_i = random model error (county random effect);
- v_i = a generalized variance function (GVF) representation of the ACS sampling variance (the GVF is described below); and
- $\sigma^2_{\omega k}$ = the model variance associated with partition k.

The independent variables that constitute the vector x_i in the free eligibility model and reduced-price eligibility model are as follows:

- Free eligibility model
  - —Tax income/poverty ratio—the ratio of the number of child exemptions in households with income less than or equal to 130 percent of the poverty level to the total number of child exemptions in the county
  - —Child tax coverage ratio—the ratio of the number of child exemptions on tax returns in the county divided by the total household population with age less than or equal to 19
  - —Four-year average ACS rate—the average of the free eligibility rates for the other 4 years of the ACS[9]
- Reduced-price eligibility model
  - —Tax income/poverty ratio—the ratio of the number of child exemptions in households with income greater than 130 percent of the poverty level but less than or equal to 185 percent of the poverty level to the total number of child exemptions in the county
  - —Four-year average ACS rate—the average of the reduced-price eligibility rates for the other 4 years of the ACS

Estimation of the parameters proceeds on the assumption that ACS sampling variances are known, using the GVF estimate, $\hat{v}_i$, described below and iterating the weighted least squares regression equations to the maximum-likelihood estimate of the model variance $\sigma^2_{\omega k}$ for each partition k.

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[9]For example, in the model for 2008, this predictor is the average of the estimates for 2005, 2006, 2007, and 2009.

The GVF model used is as follows:

$$v_i = h(m_i) \, p_i \, (1 - p_i)$$

where

- m_i = number of household respondents in ACS sample;
- p_i = free (or reduced-price) eligibility rate; and
- $h(m_i) = k \, m_i^{\delta} \varepsilon_i$.

Or transforming for estimation:

$$\log\left\{ \left(\hat{v}_i / \left(\hat{p}_i \left(1 - \hat{p}_i\right)\right)\right)^{\frac{1}{2}} \right\} = \alpha_1 + \alpha_2 \log\left(m_i\right) + \lambda_i$$

where

- $\hat{v}_i$ = direct successive difference estimate, and
- $\hat{p}_i$ = county-level fitted-value estimate of the free (or reduced-price) eligibility rate.

The parameters α_1 and α_2 were estimated with simple linear regression. The estimated value α_2 varies from –0.44 to –0.45 for all years, implying an exponent on m_i of nearly negative 1.

School District-Level Estimates

For school district j in county i, there are two estimates for Y_j: the ACS direct estimate and a predicted value derived by plugging school district-level independent variables into a model with estimated parameters from the county-level model. Values for the school district tax variables—tax income/poverty ratio free, tax income/poverty ratio reduced-price, and child tax coverage level—are calculated using minimum-change synthetic estimates.[10] Then, shrinkage estimates (empirical best predictions) for school districts (i.e., predictions of Y_j for school district j) and the corresponding prediction error variances are computed by plugging the parameter estimates into the following standard formulas (Bell, 1999):

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[10]The tax variables are prepared by tallying all tax returns that have been coded to a specific district within a county and adding in a "synthetic" estimate for those tax returns that have been coded to the county but not to a specific district. The method used is described in Maples and Bell (2007).

$$\hat{Y}_j = \left(1 - w_j\right)y_j + w_j\left(x_j'\hat{\beta}_k\right) \tag{3}$$

where

$$w_j = \frac{v_j}{\left(v_j + \sigma_{\omega k}^2\right)}$$

and

$$Var\left(Y_j - \hat{Y}_j\right) = w_j\sigma_{\omega k}^2 + w_j^2\left(x_j'Var\left(\hat{\beta}_k\right)x_j\right) \tag{4}$$

The parameters $\hat{\beta}_k$ and variance $\sigma_{\omega k}^2$ are estimates from the county model. The parameter v_j is the GVF estimate[11] for the variance of the direct ACS estimate for the district.

The standard error estimator in equation (4) does not account for estimation error in $\sigma_{\omega k}^2$; an asymptotic correction for this error was found to be small in the past. Similarly, the estimator does not account for the varying quality of the synthetic estimates of the independent variables across school districts. Hence, $\sigma_{\omega k}^2$ may be underestimated, leading to reported standard errors that are too low. Future research may be needed to address this issue.

Results and Evaluation

Regression results for 2009, including estimated coefficients and summary statistics, are shown in Table C-1. Figure C-1 displays the median free and reduced-price eligibility rates estimated by the model over time. The median free eligibility rate showed a slight upturn in 2009, while the reduced-price eligibility rate was relatively flat. Figure C-2 shows the average across districts of 5-year ACS eligibility rates for free and reduced-price meals by size of school district. Figure C-3 shows the medians (across districts) of the relative standard errors for percentages eligible for free meals estimated by the model and from the 5-year and 1-year ACS by size of school district. Figure C-4 shows the same thing for percentage eligible for reduced-price meals. Figures C-5 and C-6, respectively, show the medians of the root mean squared difference (RMSD)[12] (a measure of variation over time) for free-eligible and reduced-price-eligible percentages estimated by the model and from the 1-year ACS by size of district.

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[11]GVF is used to estimate the direct variance of the ACS estimates to reduce the volatility in this district-level shrinkage estimate.

[12]For a given single-year estimate, $\hat{Y}_{ti}$ for year t and area i, the RMSD is defined as $\mathrm{RMSD}_i = \left\{\Sigma_{t=1}^{T}\left(1/T\right)\left(\hat{Y}_{ti} - \bar{Y}_i\right)^2\right\}^{\frac{1}{2}}$ where $\bar{Y}_i = \Sigma_{t=1}^{T}\hat{Y}_{ti}/T$.

TABLE C-1 Regression Results for 2009

Resident Population Partitions	Free Eligibility			Reduced-Price Eligibility		
	< 20k	20-65k	65k+	< 20k	20-65k	65k+
Coefficient Estimates, $Z < 1.645$, $Z < 1.00$						
Tax ratio	0.74	0.75	0.39	0.51	0.50	0.33
Child filing ratio	-0.18	-0.12	-0.07			
Lagged ACS 4-year	0.28	0.31	0.65	0.01	0.07	0.33
No. of Counties	1,321	1,024	792	1,321	1,024	792
Average Dependent Variable	33.3	34.2	29.5	12.0	10.6	8.7
Model Error Variance	0.9	0.3	0.0	0.7	0.2	0.0
R^2	0.356	0.576	0.873	0.014	0.048	0.363
Standardized Residual						
Mean	0.00	-0.01	-0.02	0.00	0.00	0.00
Median	-0.08	0.01	-0.05	-0.26	-0.15	-0.08
Raw Residual						
Mean	0.08	-0.16	-0.23	0.00	0.00	0.00
Median	-1.16	0.12	-0.19	-2.80	-0.96	-0.20

SOURCE: Provided to the panel May 12, 2011, by the U.S. Census Bureau.
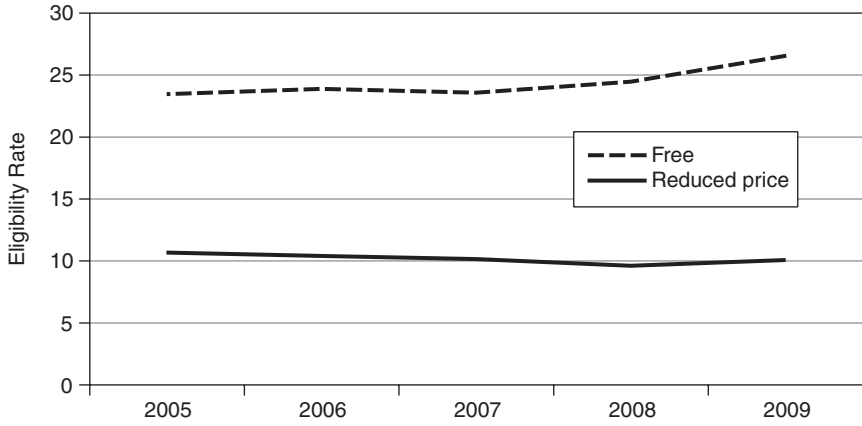
FIGURE C-1 Median free and reduced-price eligibility rates estimated by the models over time.
SOURCE: Provided to the panel May 12, 2011, by the U.S. Census Bureau.
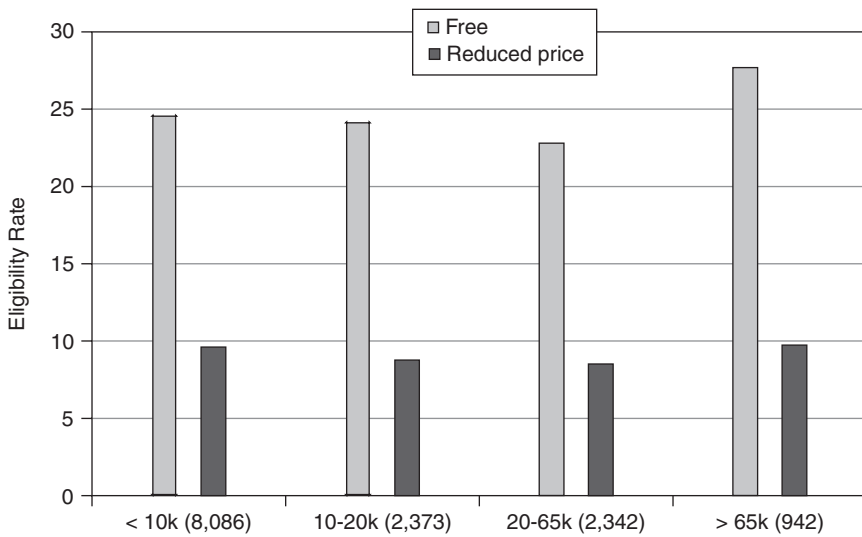
FIGURE C-2 Average 5-year ACS eligibility rates for free and reduced-price meals by size of school district.
SOURCE: Provided to the panel May 12, 2011, by the U.S. Census Bureau.
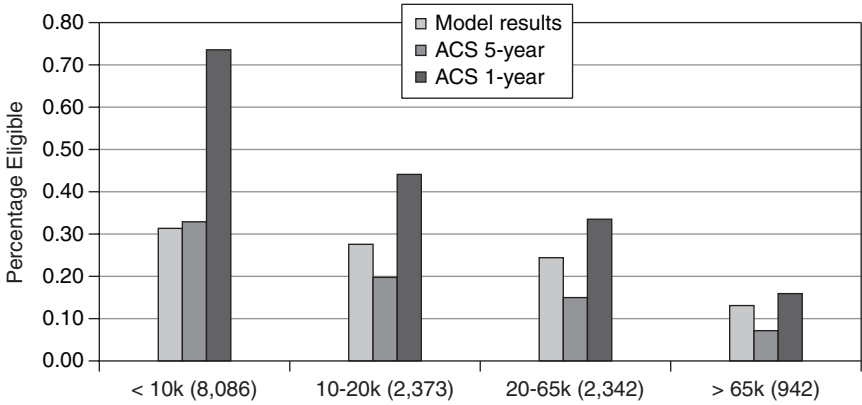
FIGURE C-3 Median of relative standard errors for percentages eligible for free meals estimated by the model and from the 5-year and 1-year ACS by size of school district.
SOURCE: Provided to the panel May 12, 2011, by the U.S. Census Bureau.
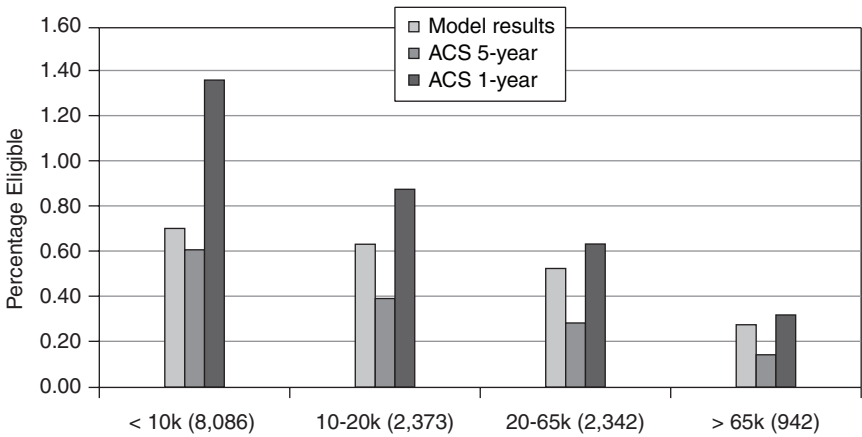
FIGURE C-4 Median of relative standard errors for percentages eligible for reduced-price meals estimated by the model and from the 5-year and 1-year ACS by size of school district.
SOURCE: Provided to the panel May 12, 2011, by the U.S. Census Bureau.
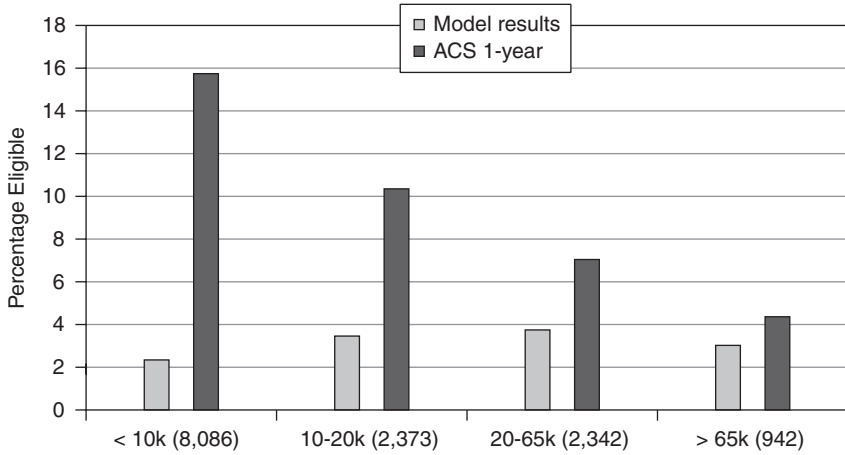
FIGURE C-5 Median of root mean squared differences (RMSDs) for free-eligible percentages estimated by the model and from the 1-year ACS by size of school district.
SOURCE: Provided to the panel May 12, 2011, by the U.S. Census Bureau.
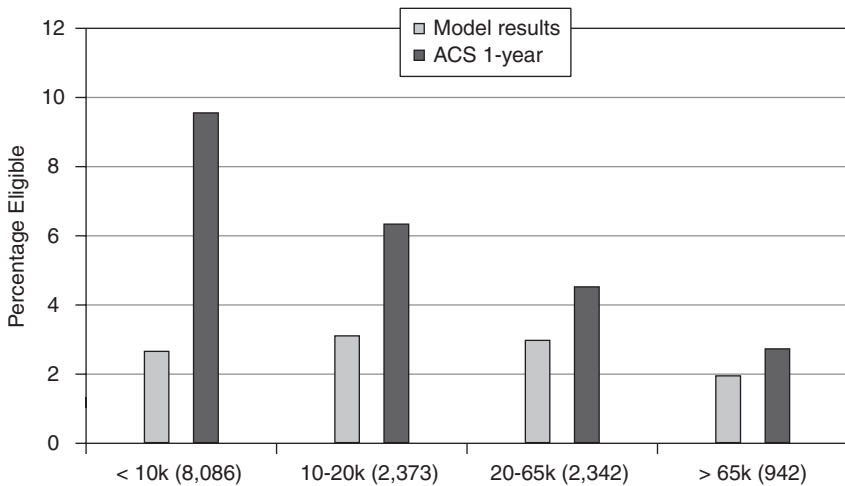
FIGURE C-6 Median of root mean squared differences (RMSDs) for reduced-price-eligible percentages estimated by the model and from the 1-year ACS by size of school district.
SOURCE: Provided to the panel May 12, 2011, by the U.S. Census Bureau.

Table C-2 shows the distribution of estimates, relative standard errors for 2009, and the RMSDs for free and for reduced-price eligibility rates estimated by the model and from the 1-year ACS.

Additional Analysis and Diagnostics

Figures C-7 and C-8 display data for free eligibility percentages, while Figures C-9 and C-10 display data for reduced-price eligibility percentages.[13] Figures C-7 and C-9 display relative standard errors for model-based estimates and 1-year and 5-year ACS estimates. Figures C-8 and C-10 display the medians of the RMSDs for the model-based and 1-year ACS estimates.

School Attendance Area Estimates

The methodology for school attendance areas is the same as that for school districts:

- The parameters $\hat{\beta}_k$ and variance $\sigma^2_{\omega k}$ are estimates from the county model.
- The prediction for a school attendance area is the empirical Bayes shrinkage estimate using:
  —the fitted value $x_s \hat{\beta}_k$, where x_s is the vector of independent variables for school attendance area *s* computed using the synthetic estimation method described for school districts;
  —$y_{s'}$ the ACS direct estimate for school attendance areas;
  —$v_{s'}$ the variance of $y_{s'}$ calculated using the same GVF as described for the county and district methodology; and
  —the shrinkage estimation methodology described for school districts.
- The school attendance areas are overlapping with respect to both geography and grade ranges,[14] so it was impractical to construct a primitive and rake to school district estimates.

The Census Bureau provided the following observations about the choice of prediction methods for school districts and school attendance areas for this study, relative to the shares methodology used for current SAIPE school district production:

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[13]Figures in this section cover only those districts with combined free and reduced-price eligibility rates over 70 percent, as measured by 5-year average empirical Bayes rate modeled estimates.

[14]For example, in many places there are elementary, middle, and secondary schools that serve the same geographic area.

TABLE C-2 Distribution of Estimates, Relative SEs (2009) and 5-Year RMSDs for Free and Reduced-Price Eligibility Rates Estimated by the Model and from the 1-Year ACS

Variable	N	Min.	1st Pctl.	5th Pctl.	25th Pctl.	50th Pctl.	75th Pctl.	95th Pctl.	99th Pctl.	Max.
					Free					
Model Est., 2009	13,753	0.2	2.3	5.8	16.2	26.5	37.7	54.4	65.9	95.6
Model Rel. SE, 2009	13,753	0.02	0.1	0.1	0.2	0.3	0.5	1.2	3.2	33.5
Model RMSD, 05–09	13,753	0.03	0.5	0.9	1.8	2.8	4.1	6.6	9.5	24.6
ACS Est., 2009	13,347	0	0	0	9.5	25.3	44.0	75.7	100	100
ACS Rel. SE, 2009	13,753	0.02	0.1	0.2	0.4	0.6	1.0	2.5	6.2	123.4
ACS RMSD, 05–09	13,687	0	0	2.3	6.7	11.5	18.6	33.3	43.3	50
					Reduced Price					
Model Est., 2009	13,753	0.4	1.9	3.4	6.7	9.5	12.9	19.3	25.1	55.1
Model Rel. SE, 2009	13,753	0	0.2	0.3	0.4	0.6	0.9	1.6	2.3	5.1
Model RMSD, 05–09	13,753	0.1	0.4	0.7	1.8	2.7	3.9	6.2	8.5	26.7
ACS Est., 2009	13,347	0	0	0	0	6.0	13.8	36.5	68.3	100
ACS Rel. SE, 2009	13,347	0.1	0.2	0.3	0.6	1.1	1.6	2.7	3.8	14.4
ACS RMSD, 05–09	13,687	0	0	0	3.7	6.8	11.9	24.9	40.9	50
					Free + Reduced Price					
Model Est., 2009	13,753	1.4	5.4	10.9	25.2	37.6	49.9	67.0	79.1	99.5

NOTE: ACS = American Community Survey; RMSD = root mean squared difference; SE = standard error.
SOURCE: Provided to the panel May 12, 2011, by the U.S. Census Bureau.
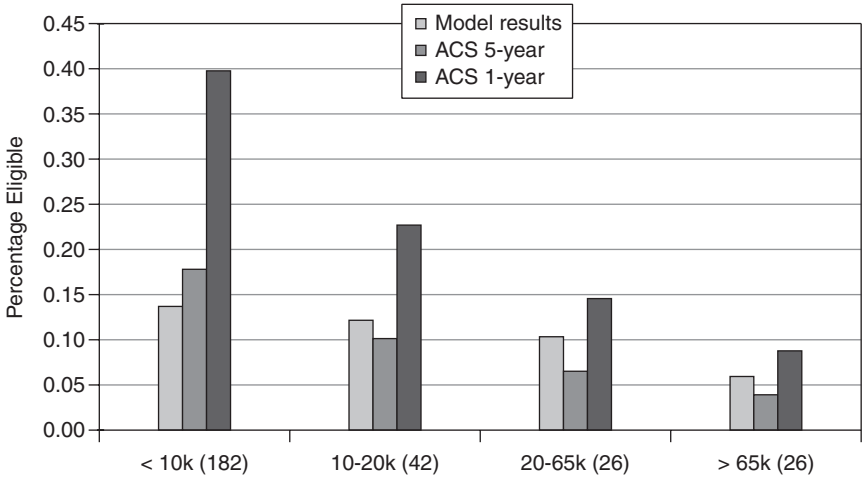
FIGURE C-7 Median of relative standard errors for model-based and 1-year and 5-year ACS-based free eligibility percentages by size of school district.
SOURCE: Provided to the panel May 12, 2011, by the U.S. Census Bureau.
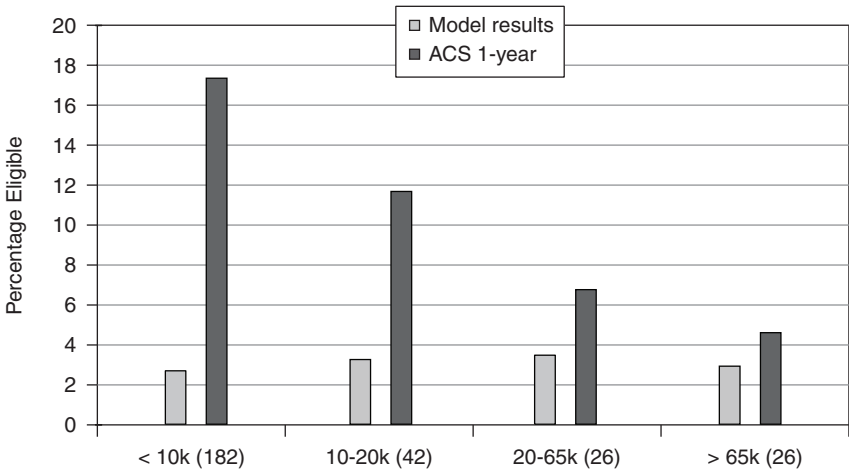
FIGURE C-8 Median of root mean squared differences (RMSDs) for model-based and 1-year ACS-based free eligibility percentages by size of school district.
SOURCE: Provided to the panel May 12, 2011, by the U.S. Census Bureau.
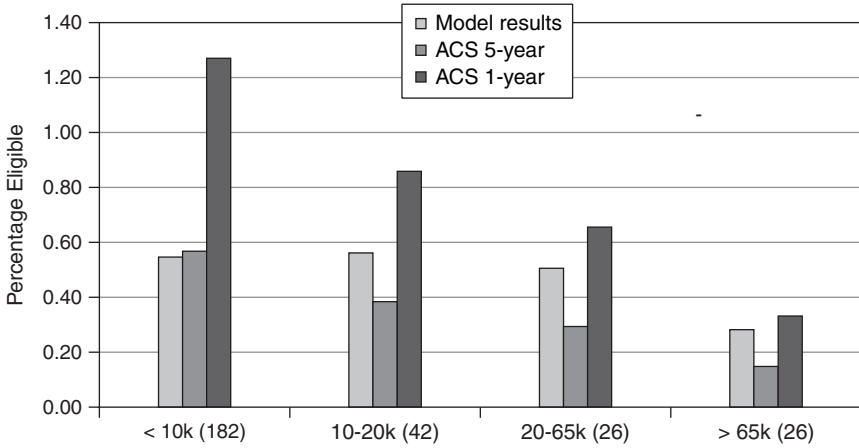
FIGURE C-9 Median of relative standard errors for model-based and 1-year and 5-year ACS-based reduced-price eligibility percentages by size of school district.
SOURCE: Provided to the panel May 12, 2011, by the U.S. Census Bureau.
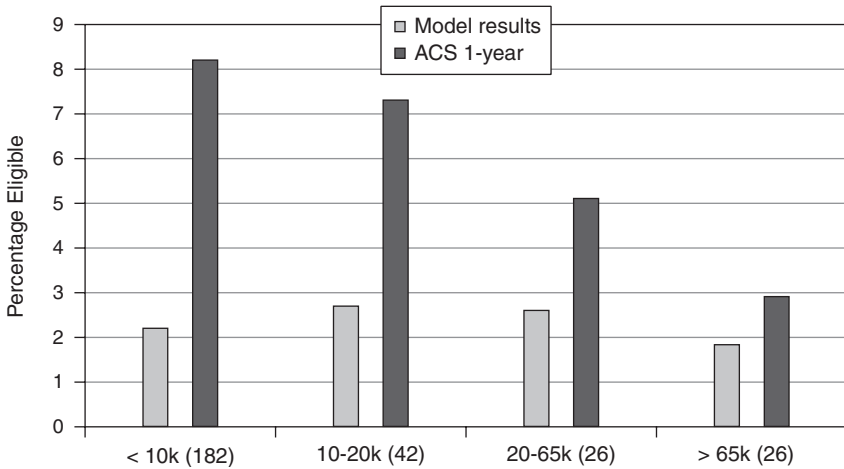
FIGURE C-10 Median of root mean squared differences (RMSDs) for model-based and 1-year ACS-based reduced-price eligibility percentages by size of school district.
SOURCE: Provided to the panel May 12, 2011, by the U.S. Census Bureau.

- The Census Bureau could not use the SAIPE relative error methodology to evaluate the estimation error of the eligibility rates for the school meals programs because it requires an independent source of poverty estimates.
- The SAIPE model uses shares from the 2000 decennial census long form as an independent variable. These shares are now 10 years old. The Census Bureau has not evaluated the use of shares from the 5-year ACS but suspects that they are less reliable. The models for the school meals programs do not use the decennial census data as an independent variable.
- The SAIPE shares methodology for the 2008 estimates did not use the direct ACS current-year estimate, so there would be a potential loss of information over the school meals model.
- The shares methodology is a two-step process, adding estimation error at each step.

PANEL'S SUGGESTIONS FOR MODELING ELIGIBILITY PERCENTAGES FOR THE SCHOOL MEALS PROGRAMS

As noted previously, the models for the school meals programs were developed quickly as a proof of the concept that using SAIPE-like small-area models for the school meals programs might provide accurate and timely estimates of eligibility. The panel considers that the work done to date demonstrates the feasibility of such an approach. While the model-based eligibility estimates for the school meals programs are timely, they did not prove to be as accurate as the 5-year ACS direct estimates. Accordingly, the panel believes that this promising approach would benefit from further research, particularly if the ACS Eligibility Option (AEO) is adopted.

Among general topics that might warrant research are (1) variations in the synthetic method used to determine school district or school attendance area estimates, (2) consideration of transformations of the variables entering model equations to improve modeling of county data, and (3) variations on the use of partitioning of county data to improve performance at the school district and school attendance area levels. The following are the panel's specific suggestions concerning approaches for improving the models:

- While the school meals programs are not "fixed-pie" fund allocation programs, controlling estimates to higher levels of geography should give the estimates greater precision and lower bias, while also improving face validity.

- Joint modeling of free and reduced-price percentages might improve the estimates. Because the two percentages are correlated (in both cases), joint modeling should improve efficiency.
- More generally, cross-sectional and time-series models using several years of ACS data could be specified and estimated to improve efficiency. See, for example, Datta, Lahiri, and Lu (1999). This approach would be preferable to using the average of four 1-year estimates as a predictor variable.
- While assuming that estimated eligibility percentages follow normal distributions may be reasonable in some instances, it is not a good assumption for small samples (as for the school attendance areas in a small or medium-sized district) or for small percentages (such as reduced-price percentages) with skewed distributions or many estimates of 0. Better approaches include transformation of the percentage, assuming a discrete distribution, using a mixed distribution, or using a linking distribution defined in [0,1], such as the logistic or beta.
- Variance estimation might be improved. For variances of direct estimates, the approach to GVF modeling should be compared to approaches in the literature. For estimating model variances, generalized maximum likelihood estimation methods have been developed that are consistent and strictly positive (in contrast to variance components methods). Another possibility is to use hierarchical Bayes or some simple approximations, such as the adjustment for density maximization method described in Morris and Tang (2011).
- Exchangeability assumptions on regression coefficients and model variances could be relaxed by introducing heterogeneity using different regression coefficients and model variances for different groups based, for example, on administrative estimates of the percentage of students eligible for free or reduced-price meals, as well as the size of the resident population.

Appendix D

American Community Survey (ACS) and Small Area Income and Poverty Estimates (SAIPE)-Like Tabulations Requested from the U.S. Census Bureau

This appendix presents the panel's request to the Census Bureau for eligibility estimates for the school meals programs from the American Community Survey (ACS). The request first provided specifications for deriving direct ACS estimates based on the panel's research, as described in Appendix B. Then, it described the level of detail desired for Small Area Income and Poverty Estimates (SAIPE)-like model-based estimates. Although the specifications for the latter estimates were adequate for the purposes of this study, the panel suggests that if SAIPE-like model-based estimates and their standard errors are needed in the future, the request should include the estimated covariance of the two percentages in addition to their standard errors. This will facilitate the calculation of standard errors of derived estimates such as percentage eligible for free or reduced-price and the blended reimbursement rate.

ACS TABULATIONS

The goal is to obtain estimates for the percentages of public school students eligible for free, reduced-price, and full-price school meals for *all* school districts in the country and for the school attendance areas in the five case study districts. We would also like estimates for the total number of public school students associated with those school districts or school attendance areas. This is an estimate for potential enrollment and will be used for evaluation. If there is a disclosure issue in a geographic region, the total number of public school students is the variable that should be suppressed. We would like to receive standard errors for all estimates.

Tabulations for school districts are requested from all five ACS 1-year releases; all three 3-year releases; and the one 5-year release for 2005, 2006, 2007, 2008, and 2009, as allowed under disclosure restrictions based on the size of each district. Most likely the tabulations for school attendance areas will be possible only using the 5-year ACS.

For all school districts, the most recent geographic boundaries, as recorded in the Topologically Integrated Geographic Encoding and Referencing (TIGER) database, should be used. In the case study districts, the School Attendance Boundary Information System (SABINS) has provided digitized boundaries and linkages to the National Center for Education Statistics' (NCES') Common Core of Data (CCD) for school attendance areas.

Identifying Public School Students

ACS person-level variables are used to define public school students:

- AGEP less than or equal to 19 (defines children);
- SCH = 2 (attended public school in last 3 months);
- SCHL less than 16 (no high school diploma or general educational development [GED] credential, no college);
- REL not equal to 16 or 17 (eliminate group quarters students); and
- SCHG =1[1] through 14 (grade level), used to assign students to school districts or school attendance areas by comparison with grade composition in school (from CCD or case study districts).

Measuring Eligibility for Schools Meals Programs

ACS variables are used to categorize each student according to eligibility (FREE, REDUCED PRICE, FULL PRICE):

- If REL = 14 (foster child), then FREE.
- If FS = 1 (household receiving food stamps), then FREE.
- If no other person in student's HH has:

    AGEP > 19 and REL = 11, 12, or 15 (no adult nonrelatives who are not unmarried partners), then:

    If any person in HH has PAP greater than zero (someone receiving public assistance income), then FREE.

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[1]This change allows us to include prekindergarten students if a school includes prekindergarten among its grades.

Otherwise

Compute lunch index as ratio of HINCP (household income) to poverty guidelines[2] (expressed as a percentage) associated with household size of NP and issued in year of ACS year. Any foster children in the household and their income should be subtracted from NP and HINCP, respectively.

If lunch index less than or equal to 130, then FREE;
If lunch index greater than 130 and less than or equal to 185, then REDUCED PRICE;
If lunch index greater than 185, then FULL PRICE.

Otherwise (there are adult nonrelatives in the household who are not unmarried partners):

If student has REL less than or equal to 10 or equal to 13 (student part of core family):

If any person in HH with REL less than or equal to 10 or REL = 13 has PAP > 0, then FREE (someone in core family receiving public assistance income).

Otherwise

Compute sum of PINCP for all persons in HH with REL less than or equal to 10 or equal to 13. Compute count of such persons. Compute lunch index as ratio of sum of PINCP to poverty guidelines associated with number of people (using guidelines appropriate to year of ACS).

If lunch index less than or equal to 130, then FREE;
If lunch index greater than 130 and less than or equal to 185, then REDUCED PRICE;
If lunch index greater than 185, then FULL PRICE.

If student has REL = 11, 12, or 15 (student part of second economic unit):

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[2]See http://www.fns.usda.gov/cnd/Governance/notices/iegs/IEGs.htm for the poverty guidelines associated with the school meals programs.

If any person in HH with REL = 11, 12, or 15 has PAP > 0, then FREE (someone in second economic unit received public assistance income).

Otherwise

Compute sum of PINCP for all persons in HH with REL = 11, 12, or 15. Compute the count of such persons. Compute lunch index as ratio of sum of PINCP to poverty guidelines associated with number of people (using guidelines appropriate to year of ACS).

If lunch index less than or equal to 130, then FREE;
If lunch index greater than 130 and less than or equal to 185, then REDUCED PRICE;
If lunch index greater than 185, then FULL PRICE.

SAIPE-LIKE TABULATIONS

The goal is to obtain SAIPE-like estimates of the percentages of public school students who are eligible for free and for reduced-price school meals, and their standard errors. The ACS-based estimates for these quantities are defined above.

The panel would like to have SAIPE-like estimates for all school districts (and states and counties) in the country for each year 2005-2009. We would also like estimates for the school attendance areas in the five case study districts. We assume that the latter would be derived using a shares-based approach that is similar to the approach used to derive school district estimates.

The panel realizes that preparing these tabulations requires adaptation of the current SAIPE model, and the time frame of the study is short. Nonetheless, the SAIPE-like estimates will provide a proof of concept for using small-area estimates of eligibility for schools and school districts.

Appendix E

Data Collected from School Districts

T he panel obtained data on school districts from a variety of sources, including both administrative data sources described in Chapter 3—the Common Core of Data (CCD) and form FNS-742. We also collected data directly from school food authority directors in selected districts. This appendix describes the panel's collaboration with these directors and the data that they provided.

In collaboration with the school food authority directors of our five case study districts, we collected school level data concerning enrollment, certification and meals served by year for those districts. The case study data collection plan is described in Chapter 4 of the panel's interim report (National Research Council, 2010); additional detail on the data is provided in Chapter 3 of this report. Part 1 of this appendix presents detail on the data collected and comparisons of data provided by the school districts and data from national administrative databases.

On March 3 and 4, 2010, the panel held a workshop with school food authority directors from the case study districts, as well as other directors who had experience with Provision 2 or 3. One representative of child nutrition services from a state education department also participated in the workshop. The agenda for the workshop appears as Part 2 of this appendix. The discussions at the workshop are summarized in Chapter 3.

The panel also conducted an informal survey of districts that reported operating under Provision 2 or 3 on the FNS-742 form. Results of that survey are discussed in Chapter 3. Part 3 of this appendix describes the survey methodology. The results of the survey represent only the views

of the respondents. The sample frame was incomplete, and the response rate was very low, so the results are not generalizable.

PART 1: CASE STUDY DISTRICTS—DATA COLLECTION AND COMPARISON OF ENROLLMENT AND CERTIFICATION

The panel contacted six school districts in the United States, inviting them to serve as case study districts for this study. Chapter 4 of the panel's interim report (National Research Council, 2010) describes how potential case study districts were identified and how they were recruited. Case study districts were needed so the panel could investigate how a new provision might work in individual schools or groups of schools. The districts provided digitized attendance area boundaries and detailed information on program operations. The ability to provide digitized attendance boundaries is a key requirement of this potential new provision if a district wishes to operate at a subdistrict level. The Census Bureau provided American Community Survey (ACS) estimates of eligibility for all the schools with boundaries in the case study districts. The panel evaluated the quality of the ACS-based estimates in terms of sampling error and other properties that affect fitness for use. This analysis is described in Appendix F. The panel also used data from the case study districts on the percentages of meals served by category (free, reduced price, and full price). The participation analysis is described in Chapter 4.

This part of the appendix documents the collection of data from the case study districts, provides a brief description of each district, and compares school-level data provided by the districts with data available through national administrative sources. It first describes the districts in terms of percentage of students that are likely to attend schools with digitized boundaries. This discussion paves the way for analysis of the impact of open enrollment, charter, and magnet schools in Appendix G. Also included is a discussion of individual schools identified by the district and by administrative sources. Finally, this part of the appendix presents comparisons of data on enrollment, number of students certified for free meals, and number of students certified for reduced-price meals for each public school listed by the district and by the National Center for Education Statistics' (NCES') CCD, a public source of information about public schools and public school districts in the United States.

The five school districts listed in Table E-1—Austin, Texas; Chatham County, Georgia; Norfolk, Virginia; Omaha, Nebraska; and Pajaro Valley, California—agreed to serve as case study districts for this study. The panel would like to express its appreciation for the vast amounts of data they provided, the help they offered while we compiled and analyzed the

TABLE E-1 Case Study Districts

School District	Number of Participating Schools	Number of Students (in thousands)	Students in Schools Without Boundaries (percentage of enrolled)*
Austin, Texas	114	83	3.0
Chatham, Georgia	46	35	5.4
Norfolk, Virginia	56	36	10.0
Omaha, Nebraska	86	47	4.6
Pajaro Valley, California	32	19	7.4

*Omaha and Chatham are also open enrollment districts. In open enrollment districts, many schools have geographic boundaries, but students are not required to attend neighborhood schools.
SOURCE: Prepared by the panel.

data, and their observations on how the school meals programs work in practice.

Charter/Magnet/Open Enrollment Boundary Issues

Austin has no charter schools and no magnet schools. The school district provided the panel with digitized boundaries for 106 schools, but the Census Bureau did not provide ACS data for 2 of these schools (Brooke Elementary and Ridgetop Elementary) because they did not pass disclosure review.[1] Boundaries were provided for schools that were in operation during 2009-2010 (a year for which the panel did not collect detailed data from the district), including two schools that were new in 2009-2010— Gorzycki Middle School and Green Tech High School. ACS estimates were provided for these schools, but the panel is not sure to which schools in prior years the data apply. There are 18 schools with no boundaries. Of these, 8 are nontraditional schools that do not participate in the school meals programs. Of the remaining 10, 5 are alternative schools, and the others appear to be traditional schools: 1 middle, 2 high, and 2 elementary schools. The percentage of students attending participating schools that do not have boundaries is only 3 percent.

Chatham provided digitized boundaries for 45 schools. There are 4 schools with no boundaries, 3 of which are charters that do not participate in the school meals programs. One is a vocational school that does participate in the school meals programs and accounts for 5.4 percent of

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[1]The panel did not receive an attendance boundary for the Read Pre-K Demonstration project; however, School Attendance Boundary Information System (SABINS) analysts determined that it does have boundaries. The attendance zone for Read includes the zones for Cook, McBee, and Wooldridge.

students in participating schools. According to the CCD, Chatham also has 13 magnet schools with 32 percent of district enrollment. Chatham is an open enrollment district.

Norfolk provided digitized boundaries for 46 schools. There are 9 schools with no boundaries enrolling 10 percent of Norfolk's students, including 4 nontraditional schools and 5 others: Early Childhood Center at Berkley/Compostella, Easton Preschool, Ghent Elementary, Rosemond Middle, and the School of International Studies. All of these schools participate in the school meals programs. The district said it has no charter or magnet schools but has 2 open enrollment schools: Dreamkeeper Academy and Ghent Elementary. The CCD indicates that there are no charter schools but lists 4 magnets: Blair Middle School, Dreamkeeper Academy, Maury High, and Norview High.[2]

Omaha is an open enrollment district. It provided digitized boundaries for 79 schools, but the Census Bureau did not provide ACS data for Franklin Elementary school because it did not pass disclosure review. The district also provided a matrix for 2009-2010 showing the number of enrolled students and numbers eligible for free and reduced-price meals by home school crossed by school attended. The district has no charter schools, but it has alternative schools and magnet schools that participate in the school meals programs. None of the 8 alternative schools has boundaries (1.6 percent of enrollment). There are 4 main magnet schools (elementary and middle combined, and the elementary parts do not have boundaries). The elementary parts account for 3.1 percent of enrollment; the middle school parts account for 4.6 percent. There are also 13 other schools that have "magnet" as part of the school name (21.1 percent of students enrolled in participating schools). The CCD has no reported charter schools or magnet schools in Omaha.

Pajaro Valley provided boundary information for 25 schools.[3] It has charters but no magnets. None of the 5 charter schools has boundary information. Two other schools did not have boundary information: New School Community Day and Renaissance High Continuation. The charter

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[2]There are two funding sources for Berkley/Campostella, and for this reason there are two catchment areas for the school. For 3-year-old children, the catchment area is the Compostella Elementary School boundary, while for 4-year-old children, the catchment area is the entire district. This is an example of a school having different boundaries for different grades.

[3]SABINS and Census Bureau analysts established that the district boundary for Pajaro Valley in the Census Bureau's Topologically Integrated Geographic Encoding and Referencing (TIGER) databases is larger than the geographic extent of the school areas reported by the district to SABINS. It was established that the latter is accurate and that the state of California did not provide updated boundaries for Pajaro Valley as part of semiannual boundary updates.

schools that participate in the school meals programs account for 6.7 percent of the enrollment of participating schools. The remaining two schools with no boundary information account for 1.4 percent of enrollment.

For all five case study districts, the ACS school district enrollment estimates are somewhat larger than the sum of school catchment area estimates and estimates for enrollment in schools without boundaries. Census Bureau and School Attendance Boundary Information System (SABINS) analysts think the difference may be due to handling of prekindergarten students. SABINS school boundaries are grade specific, beginning at kindergarten, while census districts go down to prekindergarten. If a district had students in prekindergarten, they would be included in Census Bureau school district estimates, but they would not be included in the school's counts if SABINS did not specify their inclusion.

Data Provided

The protocol used by the panel to request data from the case study districts appears as Attachment C to Chapter 4 of the panel's interim report (National Research Council, 2010). Table E-2 shows the data that were provided by the case study districts. The panel requested data for each school year from 2003-2004 through 2008-2009 so as to have data to compare with the 5-year 2005-2009 ACS estimates.

Chatham did not provide enrollment data but did provide average daily attendance and meal count information. Chatham does not have data for 2003-2004 or for 2004-2005. Norfolk provided data on direct certification and applications for 2009-2010 but does not have these data for any preceding years. For Pajaro Valley, no data are available for 2003-2004, and meal counts are not available for 2005-2006. Omaha does not have numbers of students certified for free and reduced-price meals in 2003-2004 or 2004-2005.

TABLE E-2 Data Received from Case Study Districts

Data	Austin	Chatham	Norfolk	Omaha	Pajaro Valley
Enrollment	√		√	√	√
Attendance	√	√	√	√	√
Certification	√	√	√	√	√
Direct Certification	√	√	NA	√	√
Applications	o	√	NA	√	√
Meal Counts	√	√	√	√	√

NOTE: √ = data received at school level; o = data received at district level. NA= data not available for years requested
SOURCE: Prepared by the panel.

All five districts reported that applications are reviewed and verifications are conducted centrally, by the district. Norfolk said that applications are mailed to all households for students registered at the end of July, and that applications also are available at orientation programs for new students prior to the start of the school year, online, in all school offices, and in all cafeterias. According to the Food and Nutrition Service (FNS), this approach apparently is typical, although Chatham said it is trying to get families to use the online form.

Pajaro Valley reported that it is operating under Provision 2 for breakfast in 14 schools. Omaha is using Provision 2 for breakfast in all schools. Norfolk uses a policy of no fee for reduced-price lunches and is considering Provision 2 for breakfast. Chatham began offering universal free breakfast in schools with at least 80 percent of students eligible for free and reduced-price meals in 2009-2010. Other responses provided by the case study districts to the panel's telephone survey are summarized in Annex E-1 at the end of this appendix.

Each district provided multiple lists of schools: one list with attendance, one with certification information, one with meal counts by category, sometimes another for enrollment, one with school addresses, and so on. In some cases, schools have different names on different lists. For each school district, the panel entered the school-level data into spreadsheets with one tab for each school year. In the spreadsheets, one row contains all information about a given school, including information for that school from the CCD. A number of calculated variables also are included on the spreadsheet; examples include participation rates (meals served in a category divided by students certified in that category) and number of days on which meals were served in October (average daily participation divided by the total number of meals served). These variables provided information with which to check data entry, as well as identify questions for the district.

The CCD conducts five surveys annually to collect fiscal and nonfiscal data on all public schools, public school districts, and state education agencies in the United States. For purposes of this study, the most relevant information from the CCD is school characteristics and school-level counts of enrolled students, students certified for free meals, and students certified for reduced-price meals. Enrollment and certification data are as of October 1 (or the closest school day to October 1) of the school year for all grade levels (prekindergarten, kindergarten, and grades 1 through 12) and ungraded students. State officials are instructed to include students enrolled in the school who reside in the attendance area of a different agency. This can occur, for example, when a school district "tuitions out" a student to receive some services the district cannot provide. In this case, the receiving public school and agency include the student in their membership counts. Also, if the student tuitions out to a public school

district in a different state, the student is counted where he/she receives education services. However, students tuitioned out to private schools are not included in the CCD.

FNS collects data on verification activities on the School Food Authority Verification Summary Report, Form FNS-742.[4] With few exceptions, each school district that operates the National School Lunch Program (NSLP) or School Breakfast Program (SBP) must report the information on this form annually. Section I of the form solicits information as of the last operating day in October. Among the data items included are the number of schools operating the NSLP or SBP and the number of enrolled students with access to the NSLP or SBP. The total numbers of students certified for free and reduced-price meals under the school food authority (SFA) also are reported. Data on number of schools, enrollment, and percentages of free- and reduced-price-eligible students can be compared with aggregates of school level data from the district and with school district-level data from the CCD.

For each of the five case study districts, the panel's analysis of enrollment and certification started with the district's list of schools that provided meals under the NSLP for 2008-2009 (data as of October 31, 2008). For these schools, we compared enrollment, number certified for free meals, and number certified for reduced-price meals with the equivalent data from the CCD for 2008-2009 (data as of October 1, 2008). Note that the dates of the data are different, and this is one reason we do not expect the numbers to agree perfectly. In the notes below, we describe the matching of the schools identified by the district and participating in the school meals programs with the schools listed in the district in the CCD. In most districts, there are schools (generally charter schools or nontraditional schools of some kind) that do not participate in the NSLP but for which enrollment and the numbers of students certified for free and for reduced-price meals are available. Occasionally, schools are combined for reporting purposes.

All districts identified schools with a range of grades, from prekindergarten through grade 12. School districts that operate prekindergarten programs can claim meals under either the NSLP/SBP or the Child and Adult Care Food Program.[5]

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[4]The form is available at http://www.fns.usda.gov/cnd/Governance/Forms/SFA_Direct Verification_Summary.pdf.

[5]The Child Nutrition Act of 1966 provides the following: PRESCHOOL PROGRAMS SEC. 12. §42 U.S.C. 1781. "The Secretary may extend the benefits of all school feeding programs conducted and supervised by the Department of Agriculture to include preschool programs operated as part of the school system."

Policy memorandums regarding Head Start and Even Start Programs are at the following links: http://www.fns.usda.gov/cnd/governance/Policy-Memos/2008/SP_23-2008.pdf and http://www.fns.usda.gov/cnd/governance/Policy-Memos/2008/SP_34-2008.pdf.

Austin

In 2008-2009, there were 114 schools participating in the school meals programs in Austin. All of these schools are also listed in the CCD. Data for these schools are included in the comparisons provided below. The FNS-742 form also reports that there are 114 schools participating in the school meals programs in Austin. Ten of these schools (with enrollment of 3,427, or 4.1 percent of district students) have no school-level geographic boundaries and are open enrollment schools.

Both the district and the CCD have enrollment and certification data for five nontraditional schools that do not participate in the school meals programs: the Austin State Hospital, a residential facility for students with mental health issues; the Gardner-Betts Juvenile Justice Center's Leadership Academy, a halfway house for students who have been adjudicated and incarcerated (the program is not housed in one of Austin Independent School District's [ISD's] schools); Travis County Juvenile Justice Alternative Education Program, a temporary nonresidential school for students in the county that have been adjudicated (this countywide program is hosted on one of Austin ISD's campuses, and Austin receives verification from surrounding school districts as to each students' status for meal benefits); Phoenix Academy, a residential school for students with drug addiction (not hosted on an Austin ISD campus); and Travis County Juvenile Detention Center, also a countywide program not hosted in an Austin ISD school. According to both data sets, these are small schools, with a total of 218 students in 2008-2009.

Two schools listed by the district are not shown as participating in the school meals programs and are not in the CCD—the Infant Development Center and Even Start (babies). The district says Infant Development is for the babies of students; in some cases, the district serves meals, depending on the age of the baby. The students in Even Start (babies) are categorically eligible, but the program changes location annually. The district did not provide enrollment data but did provide certification data. For each year, it also provided the list of schools where Even Start was housed.

One additional school—the Travis County Day School, with 16 students—is in some Austin district records for 2008-2009 but with no meals served.

Chatham

Chatham has 46 schools that participate in the school meals programs. For one of these schools, Woodville Tompkins Tech and Career Institute, a vocational school listed in the CCD beginning in 2007-2008, there are neither enrollment nor certification data from the CCD or the district. The Internet shows this is to be a vocational high school that serves the school

district. It is the only school serving meals that does not have geographic boundaries, and is specifically open to all district children. The other 45 schools are listed in the CCD, which contains both enrollment and certification data for these schools. The summary below is based on the 45 schools for which data are available in both systems.

There are three schools—Coastal Empire Montessori Charter (new in 2008-2009), Savannah Arts, and Oglethorp Charter—for which the district provided certification data but does not provide meals. These schools are also listed in the CCD, which contains both enrollment and certification data for them.

Three schools were not listed by the district: the Bethesda Home for Boys, the Savannah Gateway to College (new in 2008-2009), and the Universal Health Services of Savannah Coastal Harbor Treatment Center. The CCD has enrollment data for these schools but not certification data and terms them "regular" schools. The Bethesda Home for Boys collects tuition and therefore is not a public school. The Savannah Gateway to College is a charter high school. Savannah Coastal Harbor Treatment Center works with children who have failed in other residential settings; it provides 24-hour nursing in a locked and secure environment.

The CCD lists a total of 51 schools with students in Chatham (note that this excludes Woodville Tompkins). The FNS-742 form reports 55 schools for Chatham.

Norfolk

Norfolk has 56 schools that participate in the school meals programs. The district provided enrollment and certification data for all of these schools. The district also provided geographic boundaries for all schools except the 4 nontraditional schools noted below and 5 regular schools: Early Childhood Center at Berkley/Campostella, Easton Preschool, Ghent Elementary, Rosemont, and School of International Studies at Meadowbrook. Together these schools have 3,494 students, which is about 10 percent of the district's enrolled students.

In 2008-2009, the CCD listed only "regular" schools. Hence it did not list the four nontraditional schools in the district: Madison Career Center, Norfolk Marine Institute, Norfolk Re-Ed School (South Eastern Cooperative Education Programs at Tucker), and Norfolk Technical Center. The district reported that none of these is a traditional school, and all draw from the whole city. Norfolk Re-Ed School includes students from other cities as well, mainly emotionally disturbed students. Madison Career Center draws students from the whole city, primarily those with discipline problems, and attendance may be recorded at the home school. Norfolk Marine Academy is the same as Norfolk Marine Institute. Cur-

rently, students attend every other day, and attendance may be recorded at the home school. Norfolk Technical Center students alternate days there and at their home school. Students are tracked by the day and do not have access to meals at both schools on the same day. Attendance records at Norfolk Technical Center are shared electronically with the home school. (The CCD reported Norfolk Technical Center as a vocational school in 2003-2004, 2004-2005, and 2005-2006. It listed Madison Career Center as other/alternative in the same years.)

Little Creek Elementary School and Little Creek Elementary School Annex are another issue. Little Creek is among the 56 schools for which the district provided data. Although most data items were reported separately for the two schools, enrollment and attendance data provided by the district combine the two. This combined enrollment number also is reported by the CCD (the Annex is not reported separately). However, the numbers of students eligible for free and reduced-price meals as reported by the CCD match the district's data for Little Creek Elementary only. For comparison with the CCD, the panel combined the data for the Annex with the data for Little Creek Elementary, yielding a total of 51 schools. The district did not provide a separate boundary for Little Creek Elementary Annex. The FNS-742 form lists 60 schools for Norfolk.

Omaha

Omaha reported 86 schools participating in the school meals programs. Of these, 78 are traditional schools,[6] and 4 (Alice Buffett, King Science/Technology, Maars, and Morton) are magnet schools with both elementary and middle school programs. There are 8 alternative programs: Blackburn, Early Childhood Center, ESL Teen Literacy, Integrated Learning Program, JP Lord, Parrish, Transitions at PVA, and Wilson. The district also lists the University of Nebraska at Omaha (UNO)[7] as participating in the school meals programs. Three of the alternative programs (Integrated Learning Program, Lord, and Parrish) have separate elementary and secondary programs. On some lists (such as enrollment from the district), the elementary and secondary programs are counted separately; counting them separately would yield a total of 93 schools participating in

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[6]"Traditional" means the district did not list the school as "alternative." The district's lists include 7 high schools, 7 middle schools, 60 elementary schools, and 4 elementary/middle school magnets that are listed separately as elementary and middle on some lists and are combined on others. The total number of traditional schools is either 78 or 82, depending on how the 4 magnets are treated. These schools are on all lists provided by the district. They are also included in the CCD.

[7]The CCD lists JP Lord, Jackson Elementary, Transitions at PVA, and Yates as "special education schools"; all the rest are "regular."

the school meals programs. None of the 8 alternative schools has boundaries, and the 4 magnet schools have boundaries only for middle school. In these schools, the elementary program does not have a home area.

Omaha has a program whereby some students can take college courses at UNO and receive credit toward graduation, as well as credits toward a degree. Since eating at the university would be more costly for students, especially those certified for free or reduced-price meals, the district drops off meals at the university. The district lists UNO as participating in the school meals programs, but does not have enrollment or certification data for these students. Since the students belong to other schools but attend the university for one or two classes, the meals served at UNO probably are counted at the students' home schools.

The CCD lists 98 schools for Omaha, 89 of which have nonzero or nonblank enrollment. The CCD includes all the traditional schools and counts the elementary and middle school programs of the 4 magnets separately. Enrollment and certification data are available for all of these schools. The CCD lists five of the alternative schools participating in the school meals programs—Blackburn Senior High Program, ESL Teen Literacy (Career Center), Parrish, Transition Program at PVA, and Wilson— but includes no enrollment or certification data. The CCD also lists Yates Alternative Center without providing enrollment or certification data. The district reported that there was a name change, and Yates is now called the Integrated Learning Program. UNO is not listed in the CCD. In summary, the CCD has enrollment and certification data for all the traditional schools and 2 of the 9 alternative schools (Early Childhood Center and Lord), yielding a total of 80 schools (combining the magnets' elementary and middle school programs). The certification data from the district were combined for the elementary and middle school programs of 3 of the 4 magnets (Buffett, King Science and Technology, and Morton), so the comparison below is for 81 schools.

The CCD includes Omaha Public Schools Homebased, which is also on the district lists but with no meals served. The CCD lists seven schools[8] that are not on the district lists, each designated as an Early Childhood Center: Blackburn, Blumfield, DC West, Educare, Mockingbird, Karen-Western, and Fern Williams. The CCD reports enrollment at three of these. The district reported that it does serve meals at these schools. Some are Head Start programs that are operated by different school districts/entities. The FNS-742 form indicates that 88 schools in Omaha participate in the school meals programs.

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[8]These schools were reported as being in the Omaha Public School District by the CCD beginning in 2007-2008.

Pajaro Valley

In Pajaro Valley, 32 schools participate in the school meals programs. One additional school (Pacific Coast Charter) has enrollment and certification data but does not participate in school meals. Pacific Coast Charter is an independent study school. Even though it does not participate in the school meals programs, the district collects students' applications because they may have siblings at other schools in the district.

The CCD has enrollment data for the 33 schools noted above. For Cieba College Prep, there are no certification data (most likely indicating a nonresponse in these fields in the submission to NCES). The CCD has certification data for the remaining 32 schools. The 32 **schools that par**ticipate in the school meals programs and have data from both sources are included in the comparison below. The Watsonville Charter for the Arts campus is located at Alianza Charter School, and they share a cafeteria and lunchroom. They are considered one site in the school meals programs, but the district maintains counts of free and reduced-price students separately for them so they can qualify for any programs for which they wish to apply.

According to the FNS-742 form, there are 32 schools in Pajaro Valley that participate in the school meals programs. School boundary information is available for all but 7 schools: the 5 charter schools, New School Community Day, and Renaissance High Continuation.

Summary

Table E-3 shows the number of schools by district from the various sources.

The greatest differences in school counts are due to the inclusion or exclusion of alternative or nontraditional schools that may or may not

TABLE E-3 Counts of Schools in Case Study Districts

School District	District Schools Participating in NSLP	CCD Schools with Enrollment Data	Number of Schools on FNS-742*
Austin, Texas	114	120	114
Chatham, Georgia	46	51	55
Norfolk, Virginia	56	51	60
Omaha, Nebraska	86	80	88
Pajaro Valley, California	32	33	32

NOTE: CCD = Common Core of Data; NSLP = National School Lunch Program.
*For district and CCD counts, combined programs are counted as one school. We do not know exactly how data are reported on the FNS-742 form.
SOURCE: Prepared by the panel.

participate in the school meals programs. Traditional schools tend to be reported as participating and are also included in CCD reports.

The panel's analysis shows that one cannot rely on the counts of schools from any public source (other than data obtained directly from the district) as a good indicator of the number of schools participating in the school meals programs. At least in the five case study districts, however, all traditional schools participate in the school meals programs.

Table E-4 shows the weighted average percentage difference[9] between the data on enrollment and numbers of students certified for free and reduced-price meals reported by the CCD and the districts. The difference is shown separately for all schools and for elementary, middle, high, and other schools. "Other" includes any school that is not elementary, middle, or high. In Norfolk, there are no "other" schools. In Austin, "other" consists of five schools listed as alternative schools by the district. In Omaha, the four "other" schools are the three magnet schools that are combined elementary/middle schools and the Early Childhood Center. In Pajaro Valley, "other" includes the four charter schools that have combined grades. In Chatham, the "other" schools are four mixed-grade schools.

As shown in Table E-4, enrollment statistics are very close for all schools in the case study districts. In particular, for Austin and Pajaro Valley, the data from the district and from the CCD on enrollment are almost identical. For Norfolk, the data are very close for elementary schools, but show increasing differences for the higher grades. For Norfolk and Omaha, the signs of the percentage differences for enrollment are positive, indicating that CCD enrollment numbers tend to be higher than district enrollment numbers. Differences in enrollment are likely due to differences in the timing of the reporting of the data: October 1 for CCD data and October 31 for district data.

The average percent difference for the number of students certified for free meals is very small for Pajaro Valley and Norfolk. It is small for all but high schools and other schools in Austin. It is almost 8 percent (CCD number higher) for Omaha (including two outliers in the all-school average). It is about 6 percent (district numbers larger) in Chatham.

The average percentage difference for the number of students certified for reduced-price meals is about 10 percent (CCD numbers higher) for Austin and Chatham. It is quite small across the board for Norfolk, Pajaro Valley, and Omaha. This finding is somewhat surprising because the number of reduced-price-eligible students tends to be small, so that relatively small differences look like large percentages.

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[9]For each school, the percentage difference is CCD data minus district data divided by district data, expressed as a percent. To compute the weighted average percentage difference, the school level percent is multiplied by school enrollment and the sum over schools is divided by district enrollment.

TABLE E-4 Comparison of CCD and District Data on Enrollment and Numbers of Students Certified as Eligible for Free and for Reduced-Price Meals in Case Study Districts (percentage difference of enrollment-based weighted average over schools)

District	All Schools (%)	Elementary (%)	Middle (%)	High (%)	Other (%)
Enrollment					
Austin	0.01	0.02	0.00	0.00	0.00
Chatham*	4.87	1.65	−0.24	14.56	18.90
Norfolk	0.84	1.89	0.31	1.95	
Omaha	2.21	0.09	−0.08	7.29	3.60
Pajaro Valley	−0.28	0.00	0.00	−0.99	0.00
Number Free-Eligible					
Austin	−0.71	−1.51	−0.26	6.46	−0.12
Chatham	−7.17	−3.64	−9.91	−15.05	−8.03
Norfolk	0.86	0.42	0.00	2.43	
Omaha	7.48	2.71	2.91	19.57	8.14
Pajaro Valley	−0.09	0.00	−0.16	−0.14	−0.36
Number Reduced-Price-Eligible					
Austin	7.56	4.88	1.04	1.44	0.21
Chatham	8.99	9.26	12.79	4.69	5.96
Norfolk	1.02	0.23	3.79	0.64	
Omaha	−0.66	−1.94	0.41	2.21	−2.19
Pajaro Valley	0.00	0.00	0.00	0.00	0.00

NOTES: For each school, the percentage difference is CCD data minus district data divided by district data, expressed as a percent. To compute the weighted average percentage difference, the school-level percent is multiplied by school enrollment, and the sum over schools is divided by district enrollment. CCD = Common Core of Data.
*Based on comparison with average daily attendance in Chatham.
SOURCE: Prepared by the panel.

Table E-5 shows the districtwide percentage differences. Patterns shown are very similar to the enrollment-based weighted average percentages presented above.

Table E-6 shows the ratio of the average over schools of the percentage of students eligible for free or reduced-price meals[10] from the CCD to the same average percentage from district data. All ratios are close to 1, indicating that the two sources provide very similar results. The largest

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[10]For each school, the percent eligible for free or reduced-price meals is computed as the ratio of the number of students eligible for free and reduced-price meals divided by enrollment.

TABLE E-5 Comparison of CCD and District Data on Enrollment and Numbers of Students Certified as Eligible for Free and for Reduced-Price Meals in Case Study Districts (percentage difference of districtwide totals)

District	All Schools (%)	Elementary (%)	Middle (%)	High (%)	Other (%)
Enrollment					
Austin	0.0	0.0	0.0	0.0	0.0
Chatham*					
Norfolk	1.9	0.3	1.9	5.2	
Omaha	2.2	0.1	−0.1	7.3	3.6
Pajaro Valley	−0.3	0.0	0.0	−1.0	0.0
Number Free-Eligible					
Austin	−0.4	−1.6	−0.3	5.7	−17.7
Chatham	−0.1	−3.0	−9.6	−14.6	−6.8
Norfolk	0.9	0.7	0.0	2.4	
Omaha	4.9	2.4	3.1	11.7	8.9
Pajaro Valley	−0.1	0.0	−0.2	−0.2	−0.7
Number Reduced-Price-Eligible					
Austin	7.2	8.0	5.8	7.0	0.0
Chatham	5.8	6.3	7.6	4.0	2.7
Norfolk	1.5	0.0	6.4	0.7	
Omaha	−0.2	−1.6	0.5	2.3	−0.8
Pajaro Valley	0.0	0.0	0.0	0.0	0.0

NOTE: The percentage difference is the districtwide CCD total minus the districtwide total of data provided by the district, divided by the districtwide total of data provided by the district. CCD = Common Core of Data.
*Enrollment data not available for Chatham.
SOURCE: Prepared by the panel.

TABLE E-6 Ratio of Average Percentage Free and Reduced-Price-Eligible Students from the CCD to the Same Average Percentage from District Data by Case Study District (average taken over schools)

District	All Schools	Elementary	Middle	High	Other
Austin	0.99	0.98	1.00	1.06	0.92
Chatham[a]	0.99	1.01	1.00	0.88	0.96
Norfolk	0.98	0.99	0.97	0.93	
Omaha[b]	1.03	1.02	1.03	1.05	0.98
Pajaro Valley	1.00	1.00	1.00	1.00	0.98

NOTE: CCD = Common Core of Data.
[a]Enrollment data not available for Chatham. Maximum of CCD, attendance, and meals served used.
[b]Early Childhood Center omitted from Omaha for all schools and other schools.
SOURCE: Prepared by the panel.

ratio over all schools is in Omaha, where the CCD average percentage is 1.03 times the average percentage based on data obtained directly from the district.

Annex E-1

SUMMARY OF RESPONSES TO SCHOOL DISTRICT DESCRIPTIVE QUESTIONS

As described in the panel's interim report (National Research Council, 2010), the panel asked the school food authority directors of the case study districts the open-ended questions repeated below. The questions were sent to the directors by email, to facilitate preparation for a telephone interview. Answers presented below were either provided to the panel in written form or were transcribed from notes taken during the telephone interview.

1. **How is direct certification done for your district? Do you use computerized matching, or some other process? Is matching done locally or by the state? What percentage of Supplemental Nutrition Assistance Program (SNAP, formerly Food Stamp Program) students are identified by direct certification?**

Austin reported that the State Health and Human Services Commission does computerized matching and sends the results to the district. Thirty-five percent of students are directly certified.

Chatham reported that matching is done by the district, using social security numbers and dates of birth.

Omaha reported that Nebraska uses computerized matching. The district sends its list of students to the Nebraska Department of Education. The Department of Education gets the file of SNAP participants from the Nebraska Department of Health and Human Services. Matching is done on five different criteria (excluding social security number). The state sends the matched list back to the district. For last year, the number of students directly certified was 15,547. The number of SNAP participants identified on applications was 995.

Norfolk reported that once a year, the state sends the Norfolk Child Nutrition Department the social services list of SNAP participants. The district conducts the match using its lists of students by school. During the early part of the year, it runs the match often to capture kindergartners it may not have known about and people who have moved to the district as they start enrolling in school. The district would like to get updated lists from the state more often.

Pajaro Valley receives an electronic list from the county every summer. The school district does the match electronically through its data-

base. The match is done once per year, usually in July. In 2008-2009, 2,303 students were directly certified through this process.

2. **Are free and reduced-price applications processed centrally or by each school?**

All districts reported that the application and verification processes are conducted centrally, by the district.

3. **How many person-days are spent processing free and reduced-price applications each year? What is the annual cost of application processing?**
4. **How many person-days are spent verifying free and reduced-price applications each year? What is the annual cost of verification?**

The districts reported the following information about the application and verification processes:

- Austin reported that in 2009-2010 during a 30-day grace period, nine full-time equivalents (FTEs) worked for a 4-week period on application processing. Thereafter, one FTE worked on application processing for the remainder of the year. The annual cost of application processing was about $133,345.00. Approximately 3.5 person-days were spent verifying free and reduced-price applications each year, at an annual cost of $1,373.60.
- Chatham reported that the application approval process was handled by 2 full-time employees and 1 full-time substitute. This process took 90 days. The approximate cost was $10,000. The verification process took 4 weeks, and the cost was approximately $3,500.
- Norfolk had one full-time person who handled applications and verifications. She was assisted by a temporary worker for about 8 weeks during the peak application period, and others in the office assisted at that time, as well.
- Omaha reported that 13 people worked full time for 60 days and 1 person for 200 days in 2009-2010. The estimated annual cost of application processing was $68,866. This amount did not include on-site staff (office and cafeteria) who assisted with obtaining the meal applications, answering questions, updating meal codes, etc. Additionally, costs totaling $39,900 were incurred for software, hardware purchases for scanning, and online meal applications. This amount did not include the hundreds of hours of labor devoted to setting up the system in other departments. It did

include printing and mailing costs and time spent by the school food authority director. A few years ago, the district purchased scanning software. Scanning of applications has made it much easier to use the information. Three people spent 200 hours on verification, at an estimated total cost of $7,000 (including paper, mailing, and printing).

- Pajaro Valley reported that 2 to 4 people needed 4 to 6 weeks to process applications. The district received about 8,300 applications each year. Just the cost of labor to process applications, exclusive of material costs, was approximately $31,500. Verification took 10-15 days each year and cost about $800, not including material costs.

5. Have you considered adopting NSLP Provision 2 or 3? Why or why not? What factors caused you not to adopt?

- Austin considered adopting one of the provisions for high free and reduced-price schools but decided not to do so because of the first-year administrative burden.
- Chatham has considered adopting Provision 2 but has not done so because of the paperwork, lack of manpower, and challenges of obtaining board approval. During the 2009-2010 school year, Chatham began instituting universal free breakfast for 15 sites that had 80 percent or more free and reduced-price-eligible students.
- Before the current school food authority director was hired, Norfolk had several schools operating under Provision 2 or 3. When it was time to redo the base year, the new director was in place and problems arose. The district could not get those schools to submit applications. The state allowed the district to continue providing free meals for 1 year. But the next year, because so few applications had been submitted, the percentage free and reduced-price-eligible was too low. The district even lost Title I funding as a result of the low numbers. It has not considered Provision 2 or 3 again as a result, although it is considering adopting Provision 2 for breakfast only.
- Omaha is participating in Provision 2 for breakfast in all of its schools. It serves about 19,000 breakfasts under the program. Participation in the breakfast program has doubled since Provision 2 was adopted. The base year is still an issue because it is necessary to count and categorize meals by eligibility status. The district is thinking about offering breakfast in classrooms, but this would require coordination with teachers. Omaha considered Provision 2 for lunch, but did not think it made sense from a financial

point of view. The district already had excellent participation (percentage of children taking meals under the school meals programs). Participation is 80-97 percent in elementary schools and 87-97 percent in middle schools; among high schools (excluding alternative schools), one has a participation rate of 63 percent, but others range from 78 to 96 percent. This is without à la carte equivalents. If Omaha were to adopt Provision 2 for lunch, it would do so for all schools.

• Pajaro Valley offers Provision 2 only for breakfast in 14 schools. The reason it has not offered Provision 2 for lunch is political. The district has two distinct areas, one needier than the other. If some schools offered all meals for free, parents in other schools would want this too, whether the parents qualified or not. There tends to be an argument of equity. Parents and staff have a difficult time understanding that there are requirements to qualify for these programs. They feel that because they are in the same district, all schools should receive the same services.

6. Does the district (or state) participate in other special pilots or provisions, such as the elimination of reduced-price fees? If yes, please describe.

Norfolk has been running the reduced-price lunch program at no fee for some time (15-16 years). This is not a pilot, but a decision made by the director at the time. Initially, the district conducted a study and found increases in participation among students eligible for reduced-price lunch when there was no fee. However, that was a long time ago. The parents of reduced-price-eligible students tend to be working poor, many military, who have difficulty affording the 40 cents for lunch.

7. How are the digitized school areas (boundaries) determined, and how frequently are they updated?

Austin reported that the board of trustees determines individual school attendance boundaries after hearing recommendations from a citizen task force. The Facility Use and Boundary Task Force reviews current and projected population numbers, estimates the percentage of capacity at each involved school, and gathers public input to develop its boundary recommendations. Attendance zone boundaries change as needed to address overcrowded campuses or create attendance zones for new schools. The frequency of boundary changes varies across the district because of differences in population projections in various areas of the district. Austin ISD currently geocodes its student address files using

the City of Austin street centerline file and would prefer to provide this information as it is already completed. If this is not possible, however, the district would be willing to conduct a test run to determine the amount of staff time necessary to geocode 100 percent of all students using Topologically Integrated Geographic Encoding and Referencing (TIGER) files.

Pajaro Valley said the last major change to its boundaries was in 2003. There have been minimal changes to add a street here or there, but nothing significant so as not to upset parents, students, and schools. The district respondent is not sure what would be involved in geocoding student addresses using TIGER line files, but expressed willingness to work with the panel on this. However, the district has a large migrant population and children move frequently, so addresses may be an issue. The migrant season starts in May, and by October, it is over.

Omaha reported that school boundaries were digitized in a geographic information system (GIS)—Esri's ArcView—using historical maps and written descriptions of the smallest unit of division in the district, the unit zone. The boundaries underwent verification in 2008, with digitized versions of city data being used to correct all boundaries for accuracy. Parcel files from both Douglas and Sarpy Counties were used to place all lots in the correct attendance area. Additionally, streets, waterways, and railroads were used to draw boundaries not located along property lines. Boundaries are updated with any changes in attendance areas or the addition of new schools. All boundaries use spheroid Geodetic Reference System (GRS) 1980 and North American Datum 1983 (NAD83) in the coordinate system State Plane Nebraska.

Omaha currently geocodes official membership databases every year to serve a number of purposes. If the release of these data were allowed under the Family Educational Rights and Privacy Act (FERPA), the district would consider providing the panel with a geocoded version of the official membership database.

8. **Does your district use the data on numbers of children certified for free or reduced-price meals for other purposes? If so, please list programs, how much funding is involved, and the source of the funding (state, local, and other).**

Austin reported only that state and local funding was $35.5 million, and that Title I federal funding was $22 million.

Chatham reported that it uses the data on numbers of children certified for free or reduced-price meals for:

- Title I programs;
- National Assessment of Educational Progress (NAEP) programs;

- Criterion-Referenced Competency Tests (CRCTs);
- federal, state, and local grants;
- after-school and summer programs;
- the SAT; and
- summer school.

The district does not know how much funding is involved, but said the sources of funding are federal, state, and local.

The Norfolk school food authority director said there are many programs locally that use these data. With a mother's permission, free- and reduced-price-eligible children can have free driver's education, behind-the-wheel training, band equipment, payment for field trips, and so on. She does not know what would happen if individually identifiable information were not available. She has no way to know about the funding for many programs. The state requires counts of free- and reduced-price-eligible students on its state testing forms. She provides these data quarterly.

The Omaha school food authority director said Title I funding comes through the state from the federal government and is allocated to the district based on eligibility for free or reduced-price meals; for the 2008-2009 school year, this amount was $22,639,970. The district also uses eligibility for free or reduced-price lunch in the equalization-of-funds calculation, which redirects and equalizes funding at all schools based on these numbers; the amount of district funds impacted in 2008-2009 was $8,571,778.61. The district uses eligibility for free or reduced-price lunch to determine student activity card fees; the amount of district funds impacted in 2008-2009 was $474,052.50. Additionally, Omaha obtains parent-reported lunch eligibility status on transfer forms to determine eligibility in the district's open enrollment plan. School choice and transportation to schools outside a student's home attendance area are determined by reported eligibility status.

The Pajaro Valley school food authority director stated that she gives the data to the testing department and the advanced placement counselors. Those who are eligible for free or reduced-price meals incur no or reduced-price fees for tests. The data are also given on the consolidated application for Title I funding for the district.

9. **Does your district have up-to-date information about the number of charter and magnet school students and their participation in the school meals programs? Do you have data about the number of children in home-schooling? Do you have information about students attending schools outside the school attendance boundaries because of open enrollment or public school choice programs?**

Austin reported that it has no information about charter and magnet school students, children in home schooling, or students attending schools outside their attendance area because of open enrollment or public school choice programs.

Norfolk reported that it has no charter or magnet schools. It has one elementary school and one K-8 school with open enrollment. In these schools, most students are still from the local neighborhood. The district knows which students from other neighborhoods attend those schools and the name of their catchment area school. It also has a program called "minority/majority" that allows students from schools with high counts of minorities to be bused to schools that are more racially balanced. This is the last year for the program because of the cost of busing.

Omaha has had an open enrollment program since 1999 and updated the program for the 2010-2011 school year. Data were available on all students not attending their home school for the 2008-2009 school year. There were no charter schools in the district in 2010, but the district had information regarding magnet schools and home schooling.

Pajaro Valley reported that it had charter schools, some of which participate in the school meals programs. The school food authority director was not sure whether there were other charters (outside her school district) in the area. She reported that she has participation data for any schools that are part of her program but does not have any data on students that may be home schooled or attending schools outside of the district.

PART 2: AGENDA FOR WORKSHOP WITH
SCHOOL FOOD SERVICE AUTHORITY DIRECTORS
EIGHTH PANEL MEETING WORKSHOP
MARCH 3-4, 2009

The Panel on Estimating Children Eligible for School Nutrition Programs Using the ACS hosted a workshop in Washington, DC, on March 3-4, 2011. Participants included school food service authority directors from the five case study districts and selected other individuals from the school food community who could provide insights about Provision 2 and the school meals programs more generally. The purpose of the workshop was to help the panel better understand issues pertaining to a potential new provision of the school meals programs, as well as the information school districts need to determine whether to adopt this special provision. The workshop was held at the 20 F Street Conference Center, 20 F Street, NW, Washington, DC.

Agenda: March 3, 2011

9:00 AM   Welcome to Workshop, Introduction of Participants

9:15   Welcome to the National Academy of Sciences
                 Connie Citro, director, Committee on National Statistics,
                     National Academy of Sciences

9:30   Introduction to the Panel on Estimating Children Eligible
                     for School Nutrition Programs Using the ACS

10:00-10:15   Break

10:15 AM-
12:00 PM   The Policy and Program Context: Traditional Operating
                     Procedures and Old and New Special Provisions
                 Panelists: Lynn Harvey (North Carolina), Tammy Yarmon
                     (Omaha), Leo Lesh (Denver), Nicole Meschi (Pajaro
                     Valley)

                 • What value do you see in special provisions such as Pro-
                   vision 2 or the potential new provision? What challenges
                   do you see in them?
                 • Describe the administrative burdens associated with the
                   first year of Provision 2 and with subsequent base years.
                 • What do districts need to know to help them decide to
                   participate in Provision 2? What do you think they will
                   need to know to help them decide to participate in the
                   potential new provision?
                 • How would you decide between Provision 2 and the
                   potential new provision?
                 • The panel has observed that many districts elect to use
                   Provision 2 for breakfast only. Why might that be true?
                   Would you consider using the new provision for break-
                   fast only?
                 • In current practice, the panel observed that most Provi-
                   sion 2 schools are elementary schools. Do you think that
                   this is the case in general? Why or why not?
                 • What do you view as the most promising benefit of the
                   new provision?
                 • What are your greatest concerns based on what you have
                   heard about the potential new provision? How do you
                   think these concerns could be addressed?

12:00-1:00   Working Luncheon

1:00-2:30   The Effects of Offering Universal Free Meals: Participation
              and Costs
              Panelists: Leo Lesh (Denver), Tim Cipriano (New Haven),
              Terry Mendez (Brownsville), Lyman Graham (Roswell),
              Mary Jo Tuckwell (inTEAM Associates)

              - How would offering universal free meals affect the total
                number of meals served? How would it affect participa-
                tion by category? Have you seen any data on this?
              - Are costs fixed, or are there economies of scale? If the
                number of meals served goes up, what is the marginal
                cost per additional meal?
              - Texas has developed a table (to be provided at the work-
                shop) showing expected changes in participation under
                various situations for Provision 2. Are there other fea-
                tures that should be included in this kind of calculator?
              - The panel has not found much information for estimat-
                ing cost savings from not having to do applications and
                verifications, direct certification, or counting meals by cat-
                egory. Do you have a rough estimate of the cost savings
                in your district? How important are these cost savings?
                Are there advantages to elimination of applications and
                verifications other than cost savings? Are there cost sav-
                ings associated with not doing direct certification? Is this
                different for a district that is entirely on Provision 2 versus
                one that is on for only a school or group of schools?
              - If there are no applications, where would you get the
                information for other benefits, such as waivers of text-
                book or athletic fees for students eligible for free or
                reduced-price meals?

2:30-2:45   Break

2:45-4:15   Dealing with Uncertainty and Variability
              Panelists: Lynn Harvey (North Carolina), Tammy Yarmon
              (Omaha), Tim Cipriano (New Haven), Terry Mendez
              (Brownsville)

              - Provision 2 must be implemented at the beginning of a
                school year, unless the school has delayed implemen-
                tation; then it is implemented in the second claiming

period. Should the new provision also be implemented at the beginning of a school year? Is there any reason you can think of to allow for delayed implementation?

- By what date in a school year do you need to know your claiming rates for school meals?
- How much variation in claiming rates can you tolerate from year to year? There are many ways to estimate claiming rates. Some estimators rely on more recent data and are more timely; that is, they better reflect more recent economic conditions. However, they may be statistically less precise than other estimators that use data from not only the most recent year but also several previous years. With either type of estimator, it would be possible to fix claiming rates for several years and update them only every few years. This would eliminate year-to-year changes in claiming rates—except in updating years—at the risk of the rates becoming "out of date." How do you assess the potential trade-off between variability and timeliness?

4:15-5:30   Deciding to Implement Districtwide or at a Subdistrict Level (e.g., for groups of schools)
Panelists: Tammy Yarmon (Omaha), Nicole Meschi (Pajaro Valley), Lyman Graham (Roswell), Onetha Bonaparte (Chatham), Mary Jo Tuckwell (inTEAM Associates)

- What are factors that influence the decision to implement for the entire district versus for a group of schools?
- How would you determine which schools should get universal free meals?
- American Community Survey estimates will be for students living in specified school attendance areas (as opposed to attending specified schools). Charter schools, magnet schools, and open enrollment draw students from neighborhood schools.
  — How many nonneighborhood schools are in your district? What percentage of district students attend nonneighborhood schools?
  — Do you have data concerning the number of students who attend nonneighborhood schools and the neighborhood schools to which they would have been assigned?
    ○ With these data, the panel could compute free and reduced-price percentages for the open enroll-

ment schools based on an assumption that free and reduced-price students attend open enrollment schools and neighborhood schools in the same percentages as those eligible only for full-price meals.
  ○ Can you comment on the reasonableness of this assumption in your experience?
— ACS estimates for charter/magnet/some open enrollment schools will not be available (unless estimated as above) because the schools do not have distinct attendance areas. Hence the new provision may not be applicable for them separately. Would this be an issue for your district?

Agenda: March 4, 2011

8:45 AM   Welcome to Workshop, Introduction of Participants

9:00-10:30   Geography
             School Attendance Boundary Information System
               (SABINS) Collaborator: Sal Saporito
             Panelists: Onetha Boneparte (Chatham), Tim Cipriano
               (New Haven), Nicole Meschi (Pajaro Valley), Terry
               Mendez (Brownsville), Lyman Graham (Roswell)

             To implement the new provision at a subdistrict level (for a school or group of schools), the district will need to provide the Census Bureau with geographical boundaries for the school attendance areas. These digital boundaries must be in a format that the Census Bureau can use easily. Options for the district include: using (or working with) SABINS to obtain boundaries, using software provided by SABINS to obtain data, or using some other method to identify the unique census blocks that make up a school attendance area. This session will begin with introductory information from Mike and Sal.

             • What problems do you foresee in providing the Census Bureau with boundary information?
             • Which of the alternative methods of boundary definition would best fit with your district's operations?
             • What forms of collaboration between districts and with SABINS could be of help to you?

- How frequently would you need to update your information because of changes in school attendance boundaries?
- Can you comment on what might be reasonable costs to the districts if there are costs for obtaining boundaries or costs for obtaining tabulations from the Census Bureau?

10:30-10:45   Break

10:45 AM-
12:30 PM   The Process and Calculus of Decision Making: Evaluating the Attractiveness of a New Special Provision
Panelists: Lynn Harvey (North Carolina), Leo Lesh (Denver), Onetha Boneparte (Chatham), Mary Jo Tuckwell (inTEAM Associates)

- How would your district/state make a decision whether to adopt a new special provision?
- What information do you need to make this decision?
- What information on variability in reimbursements would be most useful to you? For example, the panel can provide examples of blended reimbursement rates (average reimbursement per meal) for several years for different estimation methods. Would that be useful?
- Would estimates of statistical uncertainty—for example, the margin of error for your average reimbursement rate—be useful to you?
- What is your view on using eligibility rates as claiming rates?
- Do you think claiming rates based on eligibility should be adjusted to reflect participation? Do you have ideas about how this might be done?
- Eligibility rates from the ACS will be based on children living in normal housing. Examples of students who do not live in normal housing include the homeless and some migrants. The panel is considering whether it is possible to include these students using local data and an adjustment.
- Do you know of other examples of students in your district who do not live in normal housing?
- Do you know the number of students in your district who do not live in normal housing, and which schools they attend?

- Can you comment on the National School Lunch Program (NSLP) and School Breakfast Program (SBP) eligibility status of these children?
- What do you think your colleagues would like to see in our report that would help them decide whether to use the potential new special provision?

Invited Panelists

Onetha Bonaparte, school meals program coordinator, Savannah-Chatham County Public School System, Georgia

Tim Cipriano, executive director of food services, New Haven Public Schools, Connecticut

Lyman Graham, foodservice director, Roswell Independent Public School District, New Mexico

Mary Kate Harrison, general manager, Student Nutrition Services, Hillsborough County Public School District, Florida

Lynn Harvey, section chief, child nutrition services, Division of School Support, North Carolina Department of Public Instruction, North Carolina

Leo Lesh, executive director, Enterprise Management, Denver Public Schools, Colorado

Terry Mendez, administrator for food and nutrition services, Brownsville Independent School District, Texas

Nicole Meschi, director of food and nutrition services, Pajaro Valley Unified School District, California

Mary Jo Tuckwell, senior consultant, Food Services Group, inTEAM Associates, Wisconsin

Tammy Yarmon, director, Nutrition Services, Omaha Public Schools, Nebraska

PART 3: SURVEY OF DISTRICTS OPERATING
UNDER PROVISION 2 OR 3

The panel conducted a survey of school food authority directors in school districts that have participated in Provision 2 or 3. The purpose was to identify advantages and disadvantages of these provisions from their point of view and to determine whether the respondents had data they were willing to share that would help the panel identify changes in participation due to providing universal free meals. This part of the appendix provides detail on the pilot test and methodology for this survey.

Pilot Test

The first phase of the survey was a pilot test implemented via a telephone survey that was used to obtain preliminary information and test the questionnaire. The panel obtained the School Nutrition Association (SNA) profiles of participants at their 2010 School Nutrition Association Legislative Action Conference. The profile included information about the school district and whether it participated in Provision 1, 2, or 3, as well as the school food authority director's contact information (excluding e-mail address). For the school districts on the SNA list, the panel added data concerning provision status for the past 5 years from the FNS-742 form to the SNA database. Only 16 of the 39 names on the SNA list were from school districts in the FNS-742 database that reported operating under Provision 2 or 3. The panel selected those school districts with FNS-742 provision status in no more than 4 of the 5 school years (hoping to capture school districts with a recent base year). This resulted in a list of 12[11] potential candidates for the pilot data collection. (The 4 that were not selected reported operating under a provision [not in a base year] for each of the 5 years.) E-mail addresses for the selected school districts were found via an Internet search, and an e-mail invitation to participate in the telephone survey was sent. If the school food authority director responded positively, the telephone interview was scheduled, and the interview was conducted by a panel member.

Ten of the 12 school food authority directors completed an interview. Of the 10, 1 had not implemented any special provisions, 3 were operating under Provision 2 for breakfast only, and 6 were operating under Provision 2 for both lunch and breakfast (1 districtwide). Five directors stated that they had data they could provide (2 for breakfast only). The number of schools in these districts ranged from 10 to 140, with an average of 41. Enrollment ranged from 5,400 to 89,000, with an average of 30,000.

Internet Survey

The panel prepared the Provision Database, consisting of all school districts reporting on the FNS-742 that some of their schools operated under Provision 2 or 3 (not in a base year) for 1 to 4 of school years 2004-2005, 2005-2006, 2006-2007, 2007-2008, and 2008-2009. These individual school year files were merged by district to form a longitudinal database of districts that reported participating in Provision 2 or 3 in any year. The panel decided to include only school districts with more than 500 students

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[11]Of these 12 school districts, 4 reported that they were on provision status (not in a base year) for 4 years, 2 reported 3 years, 1 reported 2 years, and 4 reported only 1 year; 1 reported to SNA operating under Provisions 1, 2, and 3.

that reported participating in Provision 2 or 3 (not in a base year) during from 1 to 4 of the past 5 years. There were 287 districts that met these criteria. The panel worked with FNS to obtain contact information for these districts. Working with its regional offices, FNS provided e-mail addresses for 100 of these districts, each of which was sent a survey questionnaire via SurveyMonkey. Twenty-two districts completed the Internet survey.

Of the 22 Internet survey respondents, 1 had not implemented a special provision and was out of scope. The number of schools in these districts ranged from 2 to 90, with an average of about 16. Enrollment ranged from 1,100 to 49,000, with an average of about 8,300. Most of these districts reported operating under Provision 2. One district reported operating under Provision 2 in the past, but could no longer afford to participate because of district finances. One school reported operating under Provision 2 for breakfast only. The others all reported operating under Provision 2 for both breakfast and lunch. Eleven reported having implemented Provision 2 districtwide.

Appendix F

Additional Information About
the Panel's Analyses

This appendix provides additional information about and results from the analyses conducted by the panel, as described in Chapter 4. Included are three parts. The first complements the comparisons discussed in Chapter 4 with some additional tables concerning the differences between American Community Survey (ACS) estimates and administrative estimates based on the National Center for Education Statistics' (NCES) Common Core of Data (CCD). The second part describes the model used to assess stability over time and provides detailed model results. The third part describes the panel's exploration of the use of global regression models for predicting differences between ACS and CCD estimates for the blended reimbursement rate (BRR) using a variety of covariates from the CCD.

PART 1: COMPARISONS OF ACS ESTIMATES AND ESTIMATES BASED ON ADMINISTRATIVE DATA

Tables F-1 and F-2 display the differences between ACS multiyear averages and CCD multiyear averages computed over roughly the same time periods. Table F-1 displays comparisons for 5-year estimates and Table F-2 for 3-year estimates. These tables present differences by district size (small, medium, and large), and free or reduced-price lunch (FRPL) category (very high, high, and low to moderate) for percentage eligible for free meals, percentage eligible for reduced-price meals, percentage eligible for free or reduced-price meals, and the BRR.

TABLE F-1 Average Differences Between ACS 5-Year Estimates and 5-Year Averages of CCD Estimates

Estimand	All Districts	Large Districts	Medium Districts	Small Districts
Very High FRPL Districts	(1,435)	(113)	(207)	(1,115)
Percentage free	–17.7	–15.2	–17.3	–18.0
Percentage reduced price	3.2	3.6	4.1	3.0
Percentage free or reduced price	–14.5	–11.7	–13.2	–15.0
BRR, $	–0.35	–0.29	–0.32	–0.36
High FRPL Districts	(3,782)	(280)	(628)	(2,874)
Percentage free	–6.5	–8.8	–7.3	–6.2
Percentage reduced price	1.9	2.2	2.3	1.8
Percentage free or reduced price	–4.7	–6.6	–5.0	–4.4
BRR, $	–0.12	–0.16	–0.13	–0.11
Low to Moderate FRPL Districts	(3,634)	(263)	(553)	(2,818)
Percentage free	–1.4	–3.7	–2.9	–9.4
Percentage reduced price	2.3	2.0	1.9	2.4
Percentage free or reduced price	0.8	–1.7	–1.0	1.4
BRR, $	0.01	–0.05	–0.03	0.02

NOTES: The ACS 5-year estimates (for 2005-2009) are compared with the average of CCD estimates for 2005-2006, 2006-2007, 2007-2008, 2008-2009, and 2009-2010. ACS = American Community Survey; BRR = blended reimbursement rate; CCD = Common Core of Data; FPRL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

The purpose of this comparison is to illustrate the differences that exist when the reference periods of the ACS and administrative estimates are as similar as possible. These tables display the same patterns as those observed in Chapter 4, where the administrative estimates pertain to the most recent year of the reference period for the ACS estimates. Namely, the ACS understates percentage free, percentage free or reduced price, and the BRR and overstates percentage reduced price. The differences are substantial in very high FRPL districts and are least pronounced in low to moderate FRPL districts; high FRPL districts fall in between. Over all districts, the BRR is understated by the 5-year ACS by 35 cents for very high FRPL districts and 12 cents for high FRPL districts, and is overstated by 1 cent in low to moderate FRPL districts.

Chapter 4 highlights the systematic differences between ACS and CCD estimates for eligibility percentages and the BRR. The following tables compare enrollment estimates from the two sources. Tables F-3 and F-4 illustrate the differences between ACS multiyear estimates and CCD

TABLE F-2 Average Differences Between ACS 3-Year Estimates and 3-Year Averages of CCD Estimates

Estimand	Large and Medium Districts		
	2005-2007	2006-2008	2007-2009
Very High FRPL Districts	(327)	(333)	(329)
Percentage free	–17.1	–17.6	–17.6
Percentage reduced price	3.5	2.9	3.2
Percentage free or reduced price	–13.6	–14.7	–14.4
BRR, $	–0.33	–0.35	–0.35
High FRPL Districts	(918)	(964)	(962)
Percentage free	–7.5	–8.7	–9.5
Percentage reduced price	1.9	1.7	1.9
Percentage free or reduced price	–5.6	–7.0	–7.6
BRR, $	–0.14	–0.17	–0.19
Low to Moderate FRPL Districts	(830)	(916)	(973)
Percentage free	–2.8	–3.5	–4.1
Percentage reduced price	1.6	1.3	1.3
Percentage free or reduced price	–1.2	–2.2	–2.9
BRR, $	–0.03	–0.06	–0.07

NOTES: The ACS 3-year estimates are compared with 3-year averages of CCD estimates. For example, the ACS estimates for 2005-2007 are compared with the average of CCD estimates for 2005-2006, 2006-2007, and 2007-2008. ACS = American Community Survey; BRR = blended reimbursement rate; CCD = Common Core of Data; FPRL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

multiyear average estimates computed over the same time periods as the ACS estimates, as well as the differences between the ACS multiyear estimates and the CCD estimates for the most recent school year that overlaps the ACS reference period. (For the latter, the ACS estimate for 2005-2009 is compared with the CCD estimate for 2009-2010, and the ACS estimate for 2007-2009 is also compared with the CCD estimate for 2009-2010.)

In addition to sampling error in the ACS estimates and various other errors in both the ACS and administrative estimates, enrollment estimates may differ because school district boundaries are different in different years. All of the ACS estimates are based on the school district boundaries recorded in the Census Bureau's Topologically Integrated Geographic Encoding and Referencing (TIGER) database for 2009-2010 and data reflecting the number of students that resided within those boundaries at some time during a calendar year. On the other hand, the CCD data reflect the district's enrollment as of October of a school year based on the boundaries for that year. School choice is another reason why enrollment estimates may differ. Children who live in the catchment area of a school

Large Districts			Medium Districts		
2005-2007	2006-2008	2007-2009	2005-2007	2006-2008	2007-2009
(118)	(119)	(116)	(209)	(214)	(213)
−15.1	−16.4	−16.8	−18.2	−18.3	−18.1
3.6	2.8	3.0	3.4	3.0	3.4
−11.5	−13.6	−13.8	−14.7	−15.3	−14.7
−0.28	−0.33	−0.33	−0.36	−0.37	−0.36
(286)	(293)	(292)	(632)	(671)	(670)
−8.9	−9.8	−10.4	−7.0	−8.2	−9.2
2.1	1.7	1.8	1.9	1.7	1.9
−6.8	−8.2	−8.6	−5.1	−6.5	−7.2
−0.17	−0.20	−0.21	−0.13	−0.16	−0.18
(270)	(293)	(303)	(560)	(623)	(670)
−3.3	−4.3	−4.7	−2.6	−3.1	−3.9
1.8	1.3	1.4	1.6	1.3	1.2
−1.4	−3.0	−3.2	−1.0	−1.8	−2.7
−0.04	−0.08	−0.08	−0.03	−0.08	−0.07

district and attend public school may not attend a school associated with the local public school district; some may attend an independent charter school, for example. These differences are discussed more fully in Chapter 4. Differences in the inclusion of prekindergarten students might also contribute to differences in enrollment estimates.

The differences shown in Table F-3 for the 5-year ACS estimates tend to be relatively small, but are largest (11 percent) for large very high FRPL districts (when compared with CCD estimates for 2009-2010). Other categories of districts have differences of 4 percent or less. The 5-year ACS estimates tend to overstate enrollment in very high FRPL districts and to understate enrollment in low to moderate FRPL districts. Similar patterns are illustrated in Table F-4, where small districts are not included because there are no 3-year ACS estimates for them.

Table F-5 shows the average differences between ACS 1-year estimates for enrollment and the CCD estimates for enrollment for each of 5 years. The ACS calendar-year estimates are compared with the CCD school year estimates for the most recent school year that overlaps the

TABLE F-3 Average Differences Between ACS 5-Year Estimates of Enrollment and Various CCD Estimates

Estimand	All Districts	Large Districts	Medium Districts	Small Districts
Very High FRPL Districts				
Difference from CCD for 09-10	358	4,038	233	33
As percentage of 09-10 CCD	9	11	4	4
Difference from CCD 5-year average	248	2,787	175	5
As percentage of CCD 5-year average	6	7	3	1
High FRPL Districts				
Difference from CCD for 09-10	–25	–19	–27	–26
As percentage of 09-10 CCD	–1	0	0	–3
Difference from CCD 5-year average	–47	–188	–32	–36
As percentage of CCD 5-year average	–1	–1	–1	–4
Low to Moderate FRPL Districts				
Difference from CCD for 09-10	–124	–1,040	–192	–30
As percentage of 09-10 CCD	–4	–4	–4	–3
Difference from CCD 5-year average	–112	–647	–161	–53
As percentage of CCD 5-year average	–3	–3	–3	–5

NOTES: The ACS 5-year estimates are compared with (1) CCD estimates for the most recent school year that overlaps the reference period of the ACS estimates (so the ACS estimates for 2005-2009 are compared with CCD estimates for 2009-2010) and (2) 5-year averages of CCD estimates (so the ACS estimates for 2005-2009 are compared with the average of CCD estimates for 2005-2006, 2006-2007, 2007-2008, 2008-2009, and 2009-2010). ACS = American Community Survey; CCD = Common Core of Data; FPRL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

calendar year. (Hence, the ACS estimate for 2009 is compared with the CCD estimate for 2009-2010.) These results are only for large districts that have ACS 1-year estimates. The percentage differences are again largest for the very high FRPL districts (averaging almost 10 percent) and lowest for the low to moderate FRPL districts (averaging about 5 percent); the high FRPL districts average –.3 percent. Here the average differences appear to be increasing in magnitude over time for both the very high and low to moderate FRPL categories.

Tables F-6 through F-8 display the average differences between various ACS estimates (5-year, 3-year, and 1-year) and the CCD estimate for the most recent school year that overlaps the reference period of the ACS estimate for low to moderate FRPL districts. These tables complement Tables 4-1, 4-2, and 4-3 in Chapter 4, which present results for the very high and high FRPL districts. Each table shows average differences for percentage free, percentage reduced price, percentage free or reduced price, and the BRR. Tables F-6, F-7, and F-8 show the same patterns of dif-

ferences as the tables in Chapter 4, but the magnitudes of the differences are much smaller.

PART 2: MODELING OF VARIATION

Let A_{dt} denote the 1-year ACS estimate of the true BRR, C_{dt}, for school district d in year t, where C_{dt} is the BRR value as computed from the CCD.[1] We write

$$C_{dt} = \mu_t + M_d + m_{dt}$$

where μ_t is a common time trend across districts, M_d is a district-specific deviation that is constant over time, and m_{dt} is the district- and time-specific deviation from the common time trend and constant district deviation. We write

$$A_{dt} = C_{dt} + \beta_t + B_d + b_{dt} + e_{dt}$$

where e_{dt} is sampling error with known variance σ^2_{dt}, and $\beta_t + B_d + b_{dt}$ represents the difference between the CCD and ACS estimates after sampling error is removed. Because the CCD is treated as the gold standard in this discussion, we refer to $\beta_t + B_d + b_{dt}$ as "bias," with β_t representing a common time trend in the bias across districts, B_d representing a district-specific bias that is constant over time, and b_{dt} representing the district- and time-specific deviation from the common time trend and constant district-specific bias. Biases here are due primarily to measurement error from the use of different concepts and measurements between the ACS and the CCD.

We treat μ_t and β_t as fixed effects (nonrandom) and the remaining terms as random effects. Hence, M_d, m_{dt}, B_d, b_{dt}, and e_{dt} are assumed to be zero mean random processes, with the following conditions on the theoretical variances and covariances:

- M_d and B_d are correlated with each other but uncorrelated with m_{dt} and $g_{dt} = b_{dt} + e_{dt}$.
- Both m_{dt} and g_{dt} are first-order autoregressive (AR(1)) processes, and their correlation with each other also has AR(1) form. All three AR(1) models have the same autoregressive coefficient.[2]

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[1]As discussed in Chapters 2-4, administrative estimates are also subject to error.
[2]In SAS, this is called the UN@AR(1) covariance structure. Although preliminary investigations did indicate similar, weak correlations for m_{dt} and g_{dt} and weak cross-correlations, the assumption of common autoregressive parameters is primarily for simplicity. In particular, it allows use of a built-in covariance structure, UN@AR(1), in SAS Proc Mixed.

TABLE F-4 Average Differences Between ACS 3-Year Estimates of Enrollment and Various CCD Estimates

Estimand	Large and Medium Districts		
	2005-2007	2006-2008	2007-2009
Very High FRPL			
Difference from CCD for 1 SY	1,438	1,529	1,276
As percentage of 1-year CCD	7	8	8
Difference from CCD 3-year average	1,183	1,290	1,013
As percentage of CCD 3-year average	6	7	6
High FRPL Districts			
Difference from CCD for 1 SY	−133	−13	−13
As percentage of 1-year CCD	−1	0	0
Difference from CCD 3-year average	−118	−85	−80
As percentage of CCD 3-year average	−1	−1	−1
Low to Moderate FRPL Districts			
Difference from CCD for 1 SY	−484	−383	−439
As percentage of 1-year CCD	−4	−3	−4
Difference from CCD 3-year average	−347	−371	−428
As percentage of CCD 3-year average	−3	−3	−4

NOTES: The ACS 3-year estimates are compared with (1) CCD estimates for the most recent school year that overlaps the reference period of the ACS estimates (so ACS estimates for 2005-2007 are compared with CCD estimates for 2007-2008) and (2) 3-year averages of CCD estimates (so ACS estimates for 2005-2007 are compared with the average of CCD estimates

TABLE F-5 Average Differences Between ACS 1-Year Estimates of Enrollment and CCD Estimates

Estimand	2005	2006	2007	2008	2009
Very High FRPL Districts					
Difference from CCD	3,149	3,941	4,628	5,057	4,418
As percentage of CCD	7	9	10	11	12
High FRPL Districts					
Difference from CCD	−184	−211	−297	−111	−131
As percentage of CCD	−1	−1	−1	0	0
Low to Moderate FRPL Districts					
Difference from CCD	−767	−1,295	−1,554	−1,650	−1,839
As percentage of CCD	−3	−5	−6	−6	−7

NOTES: Calendar year ACS estimates are compared with the CCD estimates for the most recent school year that overlaps the calendar year of the ACS. For example, the ACS estimates for 2009 are compared with the CCD estimates for 2009-2010. ACS = American Community Survey; CCD = Common Core of Data; FPRL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

Large Districts			Medium Districts		
2005-2007	2006-2008	2007-2009	2005-2007	2006-2008	2007-2009
3,816	4,078	3,376	106	147	148
8	9	9	2	3	3
3,122	3,428	2,667	88	101	113
7	8	7	2	2	2
−208	60	46	−100	−44	−38
−1	0	0	−2	−1	−1
−239	−115	−103	−64	−71	−69
−1	0	0	−1	−1	−1
−1,054	−811	−1,005	−225	−204	−206
−4	−3	−4	−4	−4	−4
−673	−736	−901	−190	−199	−214
−3	−3	−3	−4	−4	−4

for 2005-2006, 2006-2007, and 2007-2008). ACS = American Community Survey; CCD = Common Core of Data; FPRL = free or reduced-price lunch; SY = school year.
SOURCE: Prepared by the panel.

TABLE F-6 Average Differences Between ACS 5-Year Estimates and CCD Estimates for Low to Moderate FRPL Districts

Estimand	All Districts (5,255)	Large Districts (354)	Medium Districts (859)	Small Districts (4,042)
Percentage free	−4.7	−7.1	−6.1	−4.1
Percentage reduced price	2.3	2.1	1.8	2.4
Percentage free or reduced price	−2.4	−5.0	−4.3	−1.7
BRR, $	−0.06	−0.12	−0.11	−0.05

NOTES: The ACS estimates for 2005-2009 are compared with CCD estimates for the most recent school year that overlaps the reference period of the ACS estimates, namely school year 2009-2010. ACS = American Community Survey; BRR = blended reimbursement rate; CCD = Common Core of Data; FPRL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

TABLE F-7 Average Differences Between ACS 3-Year Estimates and CCD Estimates for Low to Moderate FRPL Districts

| | Large and Medium Districts | | |
| | 2005-2007 | 2006-2008 | 2007-2009 |
Estimand	(1,001)	(1,117)	(1,213)
Percentage free	−3.2	−4.4	−6.2
Percentage reduced price	1.5	1.2	1.4
Percentage free or reduced price	−1.7	−3.2	−4.8
BRR, $	−0.05	−0.08	−0.12

NOTES: The ACS estimates for a 3-year period are compared with CCD estimates for the most recent school year that overlaps the reference period of the ACS estimates. For example, ACS estimates for 2005-2007 are compared with CCD estimates for school year 2007-2008. ACS = American Community Survey; BRR = blended reimbursement rate; CCD = Common Core of Data; FPRL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

TABLE F-8 Average Differences Between ACS 1-Year Estimates and CCD Estimates for Low to Moderate FRPL Districts

| | 2005 | 2006 | 2007 | 2008 | 2009 |
Estimand	(295)	(311)	(313)	(330)	(354)
Percentage free	−3.3	−3.4	−4.8	−5.3	−5.3
Percentage reduced price	1.5	0.9	1.2	1.0	1.1
Percentage free or reduced price	−1.8	−2.5	−3.6	−4.3	−4.2
BRR, $	−0.05	−0.06	−0.09	−0.10	−0.10

NOTES: The ACS estimates are compared with the CCD estimates for the most recent school year that overlaps the reference period of the ACS estimates. For example, ACS estimates for 2005 are compared with CCD estimates for 2005-2006. ACS = American Community Survey; BRR = blended reimbursement rate; CCD = Common Core of Data; FPRL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

We constructed a data set with four variables: Y (either C_{dt} or $A_{dt} - C_{dt}$); Method (0 for C_{dt} and 1 for $A_{dt} - i$); District (1-393); and Time (1-5). The model is fitted in SAS using Proc Mixed.[3] Box F-1 displays the SAS code, and Boxes F-2 through F-7 display the SAS output.

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[3]Although fitting with Proc Mixed maximizes a Gaussian likelihood, this does not require that the error processes be jointly normally distributed. The residuals—CCD (estimated district effect) and ACS–CCD (estimated district effect)—do tend to be symmetric and strongly unimodal, but with evidence of heavier tails than normal. Without normality of the error processes, Proc Mixed still produces sensible estimates of mean, variance, and covariance parameters, comparable to method-of-moments estimates. This is why the fitted model is able to reproduce empirical variances, such as variances of 1-year changes.

Large Districts			Medium Districts		
2005-2007	2006-2008	2007-2009	2005-2007	2006-2008	2007-2009
(313)	(330)	(354)	(688)	(787)	(859)
−3.9	−5.2	−6.8	−2.9	−4.0	−5.9
1.7	1.4	1.7	1.4	1.2	1.2
−2.2	−3.9	−5.1	−1.5	−2.9	−4.7
−0.06	−0.10	−0.13	−0.04	−0.07	−0.12

BOX F-1
SAS Code for Analysis of Variability

Proc mixed data = school;
class District Method Time;
model Y = Method Time Method * Time;
random Method /subject = District type = un ggcorr;
repeated Method Time /subject = District type = UN@AR(1) rrcorr;
lsmeans Method * Time;

SOURCE: Prepared by the panel.

Box F-7 displays the least-squares means for Method*Time. These are the estimates of μ_t for the 5 years, followed by estimates of β_t for the 5 years. The 2×2 estimated G matrix in Box F-5 is the covariance matrix of (M_d, B_d). The estimated autocovariance function for m_{dt} is given by $0.01032 * (0.1704)^{|h|}$. The estimated autocovariance function for g_{dt} is given by $0.02878 * (0.1704)^{|h|}$, and the estimated cross-covariance function between m_{dt} and g_{dt} is given by $-0.00944 * (0.1704)^{|h|}$. These are the values that fill out the 10×10 covariance matrix R shown in Box F-3. The variance of g_{dt} includes the design variance, but this is not used in building the model. Assumptions about the sampling error and its design variance are introduced below to extrapolate results from large districts to medium and small districts.

Table F-9 shows variances of 1-year changes computed in the absence of a global (independent of district) time trend for large districts only. Model variances come from the SAS fit of the mixed model with UN@AR(1) covariance structure. Empirical variances are computed using

BOX F-2
SAS Proc Mixed Output:
The Mixed Procedure

Model Information

Data Set	WORK.SCHOOL
Dependent Variable	Y
Covariance Structures	Unstructured,
	Unstructured @
	Autoregressive
Subject Effects	District, District
Estimation Method	REML
Residual Variance Method	None
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Containment

Class Level Information

Class	Levels	Values
District	393	1 2 3 4 5 6 7 8 9 10 11 12 13
		14 15 16 17 18 19 20 21 22 23
		24 25 26 27 28 29 30 31 32 33
		.
		.
		.
		383 384 385 386 387 388 389
		390 391 392 393
Method	2	0 1
Time	5	1 2 3 4 5

Dimensions

Covariance Parameters	7
Columns in X	18
Columns in Z Per Subject	2
Subjects	393
Max Obs per Subject	10

Number of Observations

Number of Observations Read	3930
Number of Observations Used	3930
Number of Observations Not Used	0

Iteration	Evaluations	−2 Res Log Like	Criterion
0	1	825.49213626	
1	2	−3590.79275559	0.00012752
2	1	−3591.50965749	0.00000058
3	1	−3591.51280315	0.00000000

Convergence criteria met.

SOURCE: Prepared by the panel.

BOX F-3
SAS Output Proc Mixed
Estimated R Matrix for Large Districts

Row	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10
1	0.01032	0.001759	0.000300	0.000051	8.701E-6	-0.00944	-0.00161	-0.00027	-0.00005	-7.96E-6
2	0.001759	0.01032	0.001759	0.000300	0.000051	-0.00161	-0.00944	-0.00161	-0.00027	-0.00005
3	0.000300	0.001759	0.01032	0.001759	0.000300	-0.00027	-0.00161	-0.00944	-0.00161	-0.00027
4	0.000051	0.000300	0.001759	0.01032	0.001759	-0.00005	-0.00027	-0.00161	-0.00944	-0.00161
5	8.701E-6	0.000051	0.000300	0.001759	0.01032	-7.96E-6	-0.00005	-0.00027	-0.00161	-0.00944
6	-0.00944	-0.00161	-0.00027	-0.00005	-7.96E-6	0.02878	0.004904	0.000836	0.000142	0.000024
7	-0.00161	-0.00944	-0.00161	-0.00027	-0.00005	0.004904	0.02878	0.004904	0.000836	0.000142
8	-0.00027	-0.00161	-0.00944	-0.00161	-0.00027	0.000836	0.004904	0.02878	0.004904	0.000836
9	-0.00005	-0.00027	-0.00161	-0.00944	-0.00161	0.000142	0.000836	0.004904	0.02878	0.004904
10	-7.96E-6	-0.00005	-0.00027	-0.00161	-0.00944	0.000024	0.000142	0.000836	0.004904	0.02878

BOX F-4
SAS Output Proc Mixed
Estimated R Correlation Matrix for Large Districts

Row	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10
1	1.0000	0.1704	0.02904	0.004948	0.000843	-0.5480	-0.09338	-0.01591	-0.00271	-0.00046
2	0.1704	1.0000	0.1704	0.02904	0.004948	-0.09338	-0.5480	-0.09338	-0.01591	-0.00271
3	0.02904	0.1704	1.0000	0.1704	0.02904	-0.01591	-0.09338	-0.5480	-0.09338	-0.01591
4	0.004948	0.02904	0.1704	1.0000	0.1704	-0.00271	-0.01591	-0.09338	-0.5480	-0.09338
5	0.000843	0.004948	0.02904	0.1704	1.0000	-0.00046	-0.00271	-0.01591	-0.09338	-0.5480
6	-0.5480	-0.09338	-0.01591	-0.00271	-0.00046	1.0000	0.1704	0.02904	0.004948	0.000843
7	-0.09338	-0.5480	-0.09338	-0.01591	-0.00271	0.1704	1.0000	0.1704	0.02904	0.004948
8	-0.01591	-0.09338	-0.5480	-0.09338	-0.01591	0.02904	0.1704	1.0000	0.1704	0.02904
9	-0.00271	-0.01591	-0.09338	-0.5480	-0.09338	0.004948	0.02904	0.1704	1.0000	0.1704
10	-0.00046	-0.00271	-0.01591	-0.09338	-0.5480	0.000843	0.004948	0.02904	0.1704	1.0000

SOURCE: Prepared by the panel.

BOX F-5
SAS Output Proc Mixed

Estimated G Matrix

Row	Effect	District	Method	Col1	Col2
1	Method	1	0	0.08061	–0.02084
2	Method	1	1	–0.02084	0.02265

Estimated G Correlation Matrix

Row	Effect	District	Method	Col1	Col2
1	Method	1	0	1.0000	–0.4878
2	Method	1	1	–0.4878	1.0000

Covariance Parameter Estimates

CovParm	Subject	Estimate
UN(1,1)	District	0.08061
UN(2,1)	District	–0.02084
UN(2,2)	District	0.02265

Method UN(1,1) District 0.01032

Covariance Parameter Estimates

CovParm	Subject	Estimate
UN(2,1)	District	–0.00944
UN(2,2)	District	0.02878
Time AR(1)	District	0.1704

SOURCE: Prepared by the panel.

BOX F-6
SAS Proc Mixed Output, Fit Statistics

−2 Res Log Likelihood	−3591.5
AIC (smaller is better)	−3577.5
AICC (smaller is better)	−3577.5
BIC (smaller is better)	−3549.7

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr>ChiSq
6	4417.00	<.0001

Type 3 Tests of Fixed Effects

Effect	DF	DF	F Value	Pr> F
Method	1	784	8932.18	<.0001
Time	4	3136	43.37	<.0001
Method*Time	4	3136	62.50	<.0001

SOURCE: Prepared by the panel.

BOX F-7
SAS Proc Mixed Output, Least Squares Means

Least Squares Means

Effect	Method	Time	Estimate	Error	DF	t Value	Pr> |t|
Method*Time	0	1	1.5894	0.01521	3136	104.49	<.0001
Method*Time	0	2	1.6047	0.01521	3136	105.50	<.0001
Method*Time	0	3	1.6334	0.01521	3136	107.38	<.0001
Method*Time	0	4	1.6826	0.01521	3136	110.62	<.0001
Method*Time	0	5	1.7617	0.01521	3136	115.82	<.0001
Method*Time	1	1	−0.2054	0.01144	3136	−17.96	<.0001
Method*Time	1	2	−0.2216	0.01144	3136	−19.37	<.0001
Method*Time	1	3	−0.2681	0.01144	3136	−23.44	<.0001
Method*Time	1	4	−0.2940	0.01144	3136	−25.70	<.0001
Method*Time	1	5	−0.2787	0.01144	3136	−24.37	<.0001

TABLE F-9 Model Versus Empirical Estimates for Variances of Year-to-Year Changes, Large Districts Only

Large Districts	Variance (^{2})	Standard Deviation ($)	Standard Deviation Relative to Average CCD BRR (%)
CCD Empirical	0.016	0.125	7.6
CCD Model	0.017	0.131	7.9
ACS1 Empirical	0.035	0.187	11.3
ACS1 Model	0.049	0.222	13.4
ACS3 Empirical	0.005	0.071	4.3
ACS3 Model	0.006	0.081	4.9
ACS5 Empirical	NA	NA	NA
ACS5 Model	0.002	0.049	2.9
Model Empirical	0.014	0.12	7.3
Model Model	NA	NA	NA

NOTES: The average value of the BRR computed from CCD data for large districts was $1.65. The ratio of the standard deviation to this value is a coefficient of variation. ACS = American Community Survey; ACS1 = ACS 1-year estimates; ACS3 = ACS 3-year estimates; ACS5 = ACS 5-year estimates; BRR = blended reimbursement rate; CCD = Common Core of Data; NA = not applicable.
SOURCE: Prepared by the panel.

the following sequence of steps. First, for each available pair of consecutive years, compute the year-to-year difference for each district. Second, for each available pair of consecutive years, compute the empirical variance (across all 393 large districts) using the set of differences computed in the first step. Finally, average the empirical variances across all available pairs of years. This analysis is not affected by any time trend in the data because any trend appears in the difference for each district as $\text{trend}(t + 1) - \text{trend}(t)$, which is constant across districts for a given consecutive pair of years. That constant does not affect the empirical variance for each consecutive pair of years in the second step, so it does not affect the average empirical variance across all pairs of years in the final step.

Comparison of empirical and model variances shows that the model does a fairly good job of capturing the variance of 1-year change in CCD and of 1-year change in ACS-CCD. There are, however, some discrepancies between the empirical and model variances for the 1-year ACS estimates. Nonetheless, the standard deviations (19 cents empirical vs.

22 cents model) are not all that different from a practical point of view. Therefore, the panel believes the model can provide sensible quantitative guidance, particularly for comparing estimators, even if the specific model predictions should be treated with caution. Further research could develop and validate more refined models.

Table F-10 shows the same results on variances of 1-year changes for medium districts only. Empirical variances are computed as described above. Model variances are computed from the model fitted to the large districts only, extrapolated to medium districts using the extrapolated design variance, as described below, at the median enrollment for medium districts. There are 835 medium districts used in this analysis, with median enrollment of 4,797 students. For medium districts, the CCD empirical variance is very similar, but not identical, to that for large districts. The CCD model variance is derived from the model fitted for large districts, which does not depend on enrollment. Therefore, the CCD model row is exactly the same for medium and large districts.

TABLE F-10 Model Versus Empirical Estimates for Variances of Year-to-Year Changes, Medium Districts Only

Medium Districts	Variance ($\$^2$)	Standard Deviation ($\$$)	Standard Deviation Relative to Average CCD BRR (%)
CCD Empirical	0.017	0.130	7.9
CCD Model	0.017	0.131	7.9
ACS1 Empirical	NA	NA	NA
ACS1 Model	0.110	0.332	20.1
ACS3 Empirical	0.017	0.130	7.9
ACS3 Model	0.013	0.115	7.0
ACS5 Empirical	NA	NA	NA
ACS5 Model	0.005	0.069	4.2
Model Empirical	0.026	0.160	9.7
Model Model	NA	NA	NA

NOTES: The average value of the BRR computed from CCD data for medium districts was $1.65. The ratio of the standard deviation to this value is a coefficient of variation. ACS = American Community Survey; BRR = blended reimbursement rate; CCD = Common Core of Data; NA = not applicable.
SOURCE: Prepared by the panel.

Table F-11 shows the same results on variances of 1-year changes for small districts only. Empirical variances are computed as for large and medium districts. Model variances are computed from the model fitted to the large districts only, extrapolated to small districts using the extrapolated design variance at the median enrollment for small districts. There are 3,989 small districts used in this analysis, with median enrollment of 627 students.

As expected, the CCD empirical variance is much larger for small districts than for medium or large districts. The CCD model line again does not depend on enrollment, so it looks the same as for medium or large districts, except that the average CCD BRR has changed very slightly; thus the percentage changes slightly.

The panel considered fitting a model for 3-year estimates for either large or medium districts (or both combined) but decided that it would be difficult to fit such a model given time constraints. This is because the 3-year estimates are correlated across years because of not only the tem-

TABLE F-11 Model Versus Empirical Estimates for Variances of Year-to-Year Changes, Small Districts Only

Small Districts	Variance ($\$^2$)	Standard Deviation ($\$$)	Standard Deviation Relative to Average CCD BRR (%)
CCD Empirical	0.028	0.168	10.3
CCD Model	0.017	0.131	8.0
ACS1 Empirical	NA	NA	NA
ACS1 Model	0.569	0.755	46.1
ACS3 Empirical	NA	NA	NA
ACS3 Model	0.064	0.254	15.5
ACS5 Empirical	NA	NA	NA
ACS5 Model	0.023	0.152	9.3
Model Empirical	0.017	0.132	8.0
Model Model	NA	NA	NA

NOTES: The average value of the BRR computed from CCD data for small districts was $1.64. The ratio of the standard deviation to this value is a coefficient of variation. ACS = American Community Survey; BRR = blended reimbursement rate; CCD = Common Core of Data; NA = not applicable.
SOURCE: Prepared by the panel.

poral correlation of the BRR values but also the moving average of the sampling error. Further research could be undertaken to fit such a model.

The analysis above for medium and small districts relies on extrapolating results from the model fitted to data for large districts only. Extrapolating the fitted model as a function of enrollment requires modeling the design variance for 1-year ACS estimates in medium and small districts (which could be derived at the Census Bureau but may not be able to be released under current disclosure rules). Suppose that ACS sample sizes are constant from year to year within a district, and the design variance $\sigma^2_{dt} \equiv \sigma^2_d$ depends on the district but is constant from year to year. Given the design of the ACS, it is reasonable to assume that:

- Sampling error autocovariances are zero:

$$\mathrm{Cov}\left(e_{dt}, e_{d,t+h}\right) = \mathrm{Cov}\left(e_{d,t+h}, e_{dt}\right) = \begin{array}{l} \sigma^2_d \text{ if } h = 0 \\ 0 \text{ if } h \neq 0 \end{array}$$

  where σ^2_d is the sampling variance of the 1-year ACS estimator for district d.
- All cross-covariances with sampling error are zero.
- The design variance for 3-year ACS estimates is one-third of the design variance for 1-year ACS estimates, and the design variance for 5-year ACS estimates is one-fifth of the design variance for 1-year ACS estimates.

The design variance within a district is determined largely by sample size, which is, in turn, highly correlated with enrollment. Figure F-1 displays a scatter plot of data and the regression model fit for log(design variance) as a function of log(enrollment) for the 1-year ACS estimates in large districts. The fitted linear relationship is given by log(design variance) = 4.5 – 0.9 log(enrollment).

We choose log(enrollment) = 9.8 as a typical value for a large district because it is close to log(median(enrollment)) = 9.84. If we plug this value into the linear relationship above and transform to the design standard deviation, we get 0.1153, which is very close to the average design standard deviation across districts and years, 0.1146. Next, we take the SAS fit, which models $g_{dt} = b_{dt} + e_{dt}$ as AR(1), and approximate the fitted AR(1) by AR(1) + uncorrelated noise, where the noise has variance equal to the "typical value" .0133 = $(0.1153)^2$. The resulting model for $b_{dt} \sim$ AR(1) has process variance 0.01548 and autoregressive parameter 0.3168. Finally, taking the model for b_{dt} as fixed, let the variance for e_{dt} depend on enrollment through the above linear relationship. Tables F-10 and F-11, discussed above, were constructed using this analysis, with enrollment taken
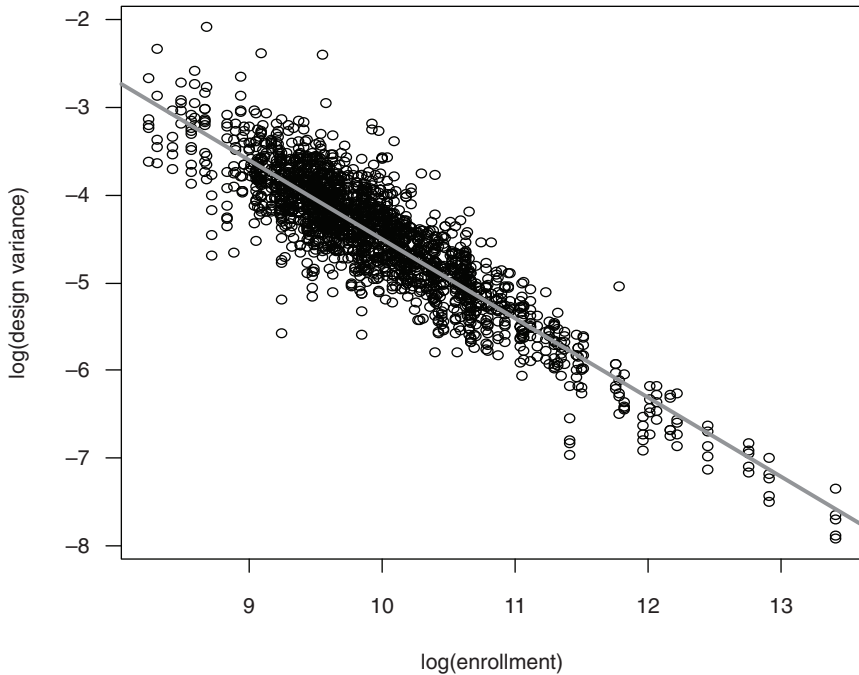
FIGURE F-1 Regression fit of log(design variance) versus log(enrollment).
SOURCE: Prepared by the panel.

to be the observed median enrollment for medium districts and for small districts, respectively.

The standard deviation (SD) and coefficient of variation (CV) (relative to mean (CCD) = $1.65) of 1-year change in 5-year estimates for various enrollments are shown in Table F-12.

There are real differences in the amount of noise under which districts normally operate with traditional application and certification procedures. Small districts combined have a percentage standard deviation (CV) of 10.3 percent for CCD 1-year changes, but those with less than the median enrollment have a CV of 11.6 percent, while those with more than the median enrollment have a CV of 8.7 percent. These are comparable to the ACS5 (modeled) CVs at enrollments of 400-800, according to Table F-12, which is the same as Table 4-8 in Chapter 4. Figure F-2, which is the same as Figure 4-5 in Chapter 4, displays a transformation of the data in Table F-12. For a given district, the point (1/enrollment, CV^2) can be plotted on the figure. If the plotted point is above the curve, the district currently experiences more variability in its administrative estimates

TABLE F-12 Intertemporal Variability of ACS 5-Year Estimates, by Enrollment

| Enrollment | Variability of 1-Year Change in ACS 5-Year Estimates of Blended Reimbursement Rates | |
	Standard Deviation ($)	Coefficient of Variation (%) (relative to BRR of $1.65)
100	0.34	20.5
200	0.25	15.1
400	0.18	11.2
800	0.14	8.3
1,600	0.10	6.3
3,200	0.08	4.8
6,400	0.06	3.8
12,800	0.05	3.2

SOURCE: Prepared by the panel.
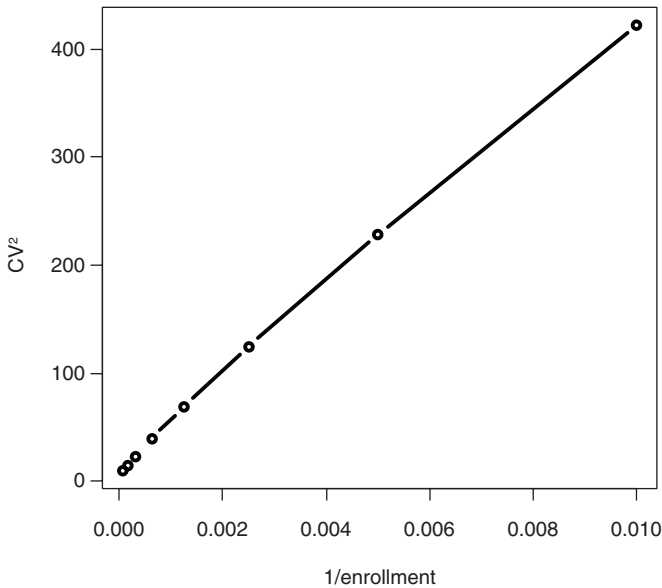
FIGURE F-2 Squared coefficient of variation of year-to-year change in ACS 5-year estimate of BRR versus inverse of enrollment.
NOTES: ACS = American Community Survey; BRR = blended reimbursement rate; CV = coefficient of variation.
SOURCE: Prepared by the panel.

than it would if it used ACS 5-year estimates (at least according to the model and ignoring timeliness bias). In this situation, the district might find use of the ACS 5-year estimates to be acceptable. On the other hand, if its plotted point is below the curve, the district currently experiences less variability in its administrative estimates than it would with the ACS 5-year estimates, and might find the latter unacceptably variable for use in determining reimbursements under the ACS Eligibility Option (AEO).

Table F-13 shows standard deviations, biases, and root mean squared errors (RMSEs) for ACS 1-year, 3-year, and 5-year estimators, with and without a 2-year lag (reflecting the lag in the availability of ACS estimates for use in establishing claiming rates). For large districts, these values are computed in two ways: (1) using the AR(1) model originally fitted via SAS for g_{dt} and (2) using the AR(1) + noise model for g_{dt}. The latter model makes results consistent with the analysis for medium and small districts, all of which use the AR(1) + noise model. The other difference in the AR(1) analysis for the large districts is that β_t is estimated from the data (see Box F-7) and incorporated in the bias computations, while in the AR(1) + noise analysis, it is assumed to be constant over time (or zero, without loss of generality). Again this is done to maintain consistency with the analysis for medium and small districts, for which estimation of β_t from the data is not possible.

TABLE F-13 Standard Deviation, Bias, and RMSE for ACS 1-Year, 3-Year, and 5-Year Estimates at Lags of 0 and 2 Years

District Size		ACS1, no lag	ACS1, lag 2	ACS3, no lag	ACS3, lag 2	ACS5, no lag	ACS5, lag 2
Large	SD (2)	0.170	0.221	0.135	0.137	0.124	0.126
	SD (1)	0.169	0.221	0.134	0.137	0.123	0.125
	Bias (2)	0.000	−0.128	−0.069	−0.153	−0.107	NA
	Bias (1)	−0.025	−0.143	−0.096	−0.131	−0.107	
	RMSE (2)	0.170	0.256	0.152	0.205	0.164	NA
	RMSE (1)	0.172	0.263	0.165	0.189	0.163	
Medium	SD	0.243	0.282	0.168	0.170	0.147	0.148
	Bias	0.000	−0.115	−0.062	−0.130	−0.092	NA
	RMSE	0.243	0.304	0.179	0.214	0.173	NA
Small	SD	0.537	0.556	0.324	0.325	0.260	0.261
	Bias	0.000	−0.104	−0.059	−0.107	−0.079	NA
	RMSE	0.537	0.565	0.329	0.342	0.271	NA

NOTES: The results for large districts were obtained using two methods: (1) using the AR(1) model for g_{dt} and (2) using the AR(1) plus noise model for g_{dt}. ACS = American Community Survey; NA = not applicable; RMSE = root mean squared error; SD = standard deviation.
SOURCE: Prepared by the panel.

The bias and RMSE results reflect the specific μ_t estimated for the particular 5-year time window covered by the estimates available to the panel, separately for each district size class. For any size class, the estimate of μ_t is simply the year t average CCD BRR across all districts. For large districts, these estimated μ_t values are given in Box F-7.

PART 3: MODEL-BASED PREDICTION OF SYSTEMATIC DIFFERENCES BETWEEN ACS ESTIMATES AND CCD ESTIMATES FOR BRR

This part of the appendix describes the results of the panel's modeling of the differences between ACS estimates and CCD estimates for the BRR. The analysis was limited to very high FRPL districts with both 5-year ACS estimates and CCD estimates for 2009-2010 in the panel's evaluation data set prog09.merged.fns. To eliminate outliers that could adversely impact regression results, we excluded any districts that had either a percentage certified for free meals of less than 10 percent or a percentage certified for free or reduced-price meals of less than 20 percent. Districts with missing data for potential predictor variables were also excluded.

The ACS estimate used in the analysis is the 5-year ACS estimate for the BRR (denoted ACS5 BRR below). The CCD estimate used is the BRR based on certification data in the 2009-2010 CCD (denoted CCD0910 BRR below). The dependent variable used in the analysis is the difference between ACS5 BRR and CCD0910 BRR divided by the standard error of ACS5 BRR. This variable is regressed on a variety of predictor variables from the 2009-2010 CCD as described below. Table F-14 provides regression results for a variety of alternative models.

In the table, p is the number of covariates in a model, and FOI stands for "first-order interactions." The "Additive" model is the most basic model, with no interactions or quadratic terms, and the "FOI, No Factor Interaction" model includes interactions among continuous covariates but not with or among the categorical covariates. Box F-8 lists the covariates used in the modeling. The results of our exploratory analyses of whether a global predictive model could be used for adjusting for differences between ACS and administrative estimates are discussed in Chapter 4.

TABLE F-14 Results for Various Models Predicting Differences Between ACS 5-Year Estimates for 2005-2009 and CCD Estimates for 2009-2010

Model Covariates	Without FRPL Covariates (1,433 districts)					With FRPL Covariates (1,366 districts)				
	p	R^2	Adj. R^2	RMSE	AIC	p	R^2	Adj. R^2	RMSE	AIC
Additive	73	0.420	0.389	1.068	−6009	81	0.628	0.604	0.806	−6408
FOI, No Factor Interactions	159	0.572	0.519	0.917	−6273	258	0.779	0.727	0.621	−6765
FOI, No State/Locale Interactions	172	0.579	0.522	0.910	−6271	334	0.804	0.740	0.585	−6777
FOI, No State Interaction	317	0.650	0.550	0.830	−6245	542	0.855	0.760	0.503	−6774
FOI, All Variables	717	0.782	0.563	0.655	−6124	981	0.923	0.728	0.366	−6768
FOI and Quadratic	726	0.784	0.561	0.652	−6116	996	0.926	0.726	0.359	−6784

NOTES: The basic model is $\dfrac{\text{ACS5 BRR} - \text{CCD0910 BRR}}{SE(\text{ACS5 BRR})} \sim$ covariates. AIC = Akaike Information Criterion; ACS = American Community Survey; FOI = first-order interactions; NA = not applicable; RMSE = root mean squared error.
SOURCE: Prepared by the panel.

BOX F-8
Covariates Used in Regression Analysis

The covariates in the "Without FRPL" models are as follows:

1. C0910_Num_Enroll (number of enrolled students)
2. C0910_Pct_inNonRegSch (percentage of students in nonregular—special education, vocational education, or alternative—schools)
3. C0910_Pct_inChartSch (percentage of students in charter schools)
4. C0910_Pct_inChartNonRegSch (percentage of students in charter or nonregular schools)
5. C0910_Pct_inChartMagSch (percentage of students in charter or magnet schools)
6. C0910_Pct_inChartMagNonRegSch (percentage of students in charter, magnet, or nonregular schools)
7. C0910_Pct_AIAN (percentage of students who are American Indian or Alaska Native)
8. C0910_Pct_AsianHNPI (percentage of students who are Asian, Hawaiian Native, or Pacific Islander)
9. C0910_Pct_Hispanic (percentage of students who are Hispanic)
10. C0910_Pct_Black (percentage of students who are black)
11. C0910_Pct_White (percentage of students who are white)
12. C0910_ChartDistance (index measuring distance to nearby charter-only districts)
13. C0910_ChartDistance_Enroll (index measuring distance to nearby charter-only districts, weighted by charter enrollment)
14. C0910_ChartDistance_Enroll_Rel (index measuring distance to nearby charter-only districts, weighted by charter enrollment relative to district's enrollment)
15. C_State (state)
16. C_Locale_Type (type of locale as defined in CCD)

The "With FRPL" models add the following covariates:

17. C0910_Pct_Free (percentage of students certified for free meals)
18. C0910_Pct_Reduced (percentage of students certified for reduced-price meals)
19. C0910_Num_Free (number of students certified for free meals)
20. C0910_Num_Reduced (number of students certified for reduced-price meals)
21. C0910_ChartDistance_FRPL (index measuring distance to nearby charter-only districts, weighted by number of charter students certified for free or reduced-price meals)
22. C0910_ChartDistance_FRPL_Rel (index measuring distance to nearby charter-only districts, weighted by number of charter students certified for free or reduced-price meals relative to number in district)
23. C0910_Need (categorical variable for whether percentage of students certified for free or reduced-price meals is < 50, 50-74, or ≥ 75)
24. C0910_CCDSchools_CharterCode (categorical variable for whether all, some, or none of the schools in district are charter schools)

SOURCE: Prepared by the panel.

Appendix G

Causes of Systematic Differences Between American Community Survey (ACS) and Administrative Estimates

Chapter 4 describes the major causes of systematic differences between ACS estimates for percentages eligible for free, reduced-price, and full-price school meals and the data from administrative sources. This appendix provides additional background information about some of those causes, including

- underreporting of Supplemental Nutrition Assistance Program (SNAP, formerly Food Stamp Program) benefits;
- determining eligibility using annual rather than monthly income;
- school choice opportunities;
- imputation for nonresponse; and
- certification errors.

Each of these causes is discussed in turn below.

UNDERREPORTING OF SNAP BENEFITS

As discussed in Chapter 4 and Appendix B, considerable research through the years has documented underreporting of benefits such as SNAP in household surveys. The panel conducted its own evaluation by comparing ACS estimates of SNAP reporting by households with school aged children to estimates from administrative data. The panel received a file from Mathematica Policy Research comparing counts and eligibility percentages for 2009 from two different data sources: the 2009 ACS

Public Use Microdata Sample (PUMS) files and the 2009 SNAP Quality Control file (SNAP QC). The data support an investigation of the potential undercount of SNAP participation in student households by the ACS at the national and state levels.

The SNAP QC data are sample-based administrative data that are representative at the state level and contain detailed demographic, economic, and SNAP eligibility information for an annual sample of more than 45,000 SNAP households. The data are weighted to match administrative counts of individuals and households receiving benefits and the amount of benefits received (adjusted to remove ineligible households that received benefits in error and those receiving disaster assistance benefits). The SNAP QC data represent all SNAP participants regardless of where they live (so noninstitutionalized group quarter residents are included).[1]

The SNAP QC data do not include *all* individuals in households where someone receives SNAP benefits. The data include individuals in the SNAP filing unit (those covered by SNAP), and only those individuals outside the filing unit (but in the household) whose income or assets would be counted in determining eligibility and benefits. The tables below include individuals in the filing unit as well as any other individuals in the household that are included in the SNAP QC data. There are about 1.85 children per SNAP household in the SNAP QC data.

In the ACS, SNAP participation is a household question, but it is also asked of group quarter respondents. We counted a household as having SNAP benefits if the household question was answered in the affirmative. We counted everyone living in that household as receiving SNAP benefits. According to the ACS, there were 1.89 children in each SNAP household in 2009, compared with 1.85 children per SNAP household in the SNAP QC data. Differences in household sizes across the two data sets are discussed below. On the ACS, the group quarter respondents who reported SNAP participation were split approximately evenly between institutional and noninstitutional group quarters; only those in noninstitutional group quarters are included in the tables below.

There is an additional difference in the way eligibility is determined in the two data sets. In SNAP QC, eligibility is based on income and filing unit as reported on an application (and determined to be accurate). The SNAP QC file has monthly income,[2] and eligibility is based on a

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[1]There is no way to identify group quarter individuals in the SNAP QC data.

[2]The panel's Food and Nutrition Service (FNS) contacts told us that applications for school meals generally report monthly or more frequent income (e.g., weekly or biweekly). The same is likely to be true of SNAP applications. It is more convenient to recode income to a common monthly value in a data set such as SNAP QC.

comparison with the income eligibility guidelines. The SNAP QC-based eligibility is from applications made in fiscal year 2009, so the data reflect the participant's situation in that year.

For the ACS data, eligibility is based on "povpip."[3] Povpip is based on annual income as reported on a survey form completed during 2009, adjusted to represent income data in 2009 and compared with the 2009 poverty guidelines. A survey completed in January 2009 would reflect data on income received mainly during 2008 (representing income from the same day in January 2008 through the survey day in January 2009).[4] A survey completed in December 2009 would reflect income from the survey date in December 2008 through the survey date in December 2009. Thus there is about a half-year lag in the ACS income data relative to the SNAP QC income data.[5] Additionally, as discussed later in this appendix, if monthly income is variable, using annual income smooths over periods of high and low income and may understate income eligibility for the school meals programs.

Similarly, the ACS question on SNAP participation asks whether any-one in the household received food stamp benefits during the last 12 months. Individuals in a household that received SNAP benefits in 2008 could still have been eligible in 2009. However, it is also possible that their situation changed and that they were no longer eligible in 2009. Under the school meals programs, if a household is determined to be eligible for school meals because of SNAP participation or income, a student in that household remains eligible for school meals for the rest of the school year and for 1 month into the next.

The tables provided to the panel compared ACS and SNAP QC esti-mates of number of households with SNAP benefits, number of house-holds with SNAP benefits with children aged 5-17, number of individuals with SNAP benefits, and number of individuals aged 5-17 with SNAP benefits.

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[3]Povpip is the ratio of income to the poverty threshold computed by the Census Bureau and made available in its data products. For family members, it is the ratio of family in-come to the appropriate poverty threshold. For unrelated individuals, it is personal income compared with the one-person poverty threshold. It is not defined for unrelated individuals under age 15 because income data are not collected for these individuals. It is not defined for some GQ individuals. If povpip is not defined, the person is classified as eligible for free meals.

[4]Instructions state that the respondent is to report his or her income during the last 12 months and explains that this means "from today's date one year ago through today." However, it would be surprising if people know their income by such specific time periods.

[5]ACS income are adjusted using the Consumer Price Index to reflect calendar year 2009 dollars.

Comparison of ACS and SNAP QC

Table G-1 shows national-level counts of households (all and those with children aged 5-17) and individuals (all and those aged 5-17) receiving SNAP benefits in 2009, based on the ACS versus SNAP QC. The table presents the difference between the estimates from the two data sources, the difference expressed as a percentage of the ACS count, the standard error of the difference, and a z-statistic for testing whether the difference is statistically significant. The hypothesis that the ACS and SNAP QC estimates are the same is rejected at the 5 percent significance level if z is greater than 1.96 in absolute value. All differences are statistically significant. The ACS overstates individuals receiving SNAP benefits,[6] while it understates households, households with children aged 5-17, and individuals aged 5-17 receiving SNAP benefits.

Table G-2 shows counts by state for our population of interest: children aged 5-17 in households receiving SNAP benefits in 2009. At the national level, the difference between the ACS and SNAP QC counts is statistically significant at the 5 percent level. ACS undercounts this population by 4.4 percent. For California, Delaware, New Mexico, and Tennessee, the difference between the ACS and SNAP QC estimates is significant at the .001 level, indicating undercounts by the ACS of 14.5 percent, 32.8 percent, 24.7 percent, and 14.6 percent, respectively.[7] In other states the differences are not statistically significant. These results demonstrate the variability among states in the tendency to underreport SNAP benefits.

DETERMINING ELIGIBILITY USING ANNUAL VERSUS MONTHLY INCOME

This section addresses the potential differences in eligibility percentages due to computing eligibility for school meals based on annual income, the only option available for the ACS, and computing eligibility based on monthly income, as is done in the school meals programs. The panel based its evaluation on the 2004 SIPP, a national panel survey that collects monthly income data.

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[6]The overstatement of individuals on SNAP by ACS may be due to the fact that receipt of SNAP is a household question and all members of the household are assumed to be on SNAP.

[7]The .001 significance level for each state-level test assures that the chance of rejecting the hypothesis of no difference when 51 state-level tests are conducted simultaneously has an overall significance level of .05. The Sidak multiple comparison correction selects alpha per comparison = $1 - (1\text{-alpha*})^{\wedge}(1/n)$, where alpha* is the desired overall significance level and n is the number of comparisons. If alpha* = .05, then $.95^{\wedge}(1/51) = .999$, so alpha per comparison should be .001; the critical value for a z-statistic with alpha = .001 is 3.

TABLE G-1 Comparison of Counts of Households and Individuals Receiving SNAP Benefits at the National Level, ACS Versus SNAP QC, 2009

	ACS (thousands)	SNAP QC (thousands)	ACS– SNAP QC (Diff.)	Diff. as % of ACS	SE Diff.	z Diff.
Households	11,718	14,981	–3,263	–27.8%	37	–88.2
Households with Children Aged 5-17	5,279	5,658	–379	–7.2%	48	–8.0
Individuals	39,590	35,073	4,517	11.4%	190	23.8
Individuals Aged 5-17	10,041	10,486	–446	–4.4%	95	–4.7

NOTES: ACS = American Community Survey; SE = standard error; SNAP = Supplemental Nutrition Assistance Program (formerly Food Stamp Program); SNAP QC = SNAP Quality Control Data File.
SOURCE: Prepared by the panel using 2009 ACS and FY 2009 SNAP QC estimates provided by Mathematica Policy Research, September 2011.

Survey of Income and Program Participation (SIPP)[8]

SIPP is a continuing program of the Census Bureau, which began interviewing for the survey in late 1983 and is planning to introduce a major redesign in 2013. Under the survey's current design, members of sampled households (panels) are interviewed every 4 months for 3 or 4 years. Hence, SIPP not only provides detailed annual and monthly information on income by source for a representative sample of U.S. households but also tracks changes in program eligibility and participation for the household members as their incomes and other circumstances change. SIPP asks about participation of household members in SNAP, the National School Lunch Program (NSLP), the School Breakfast Program (SBP), Temporary Assistance for Needy Families (TANF), and other programs for low-income persons. In addition, it collects data on taxes, assets, liabilities, labor force participation, general demographic characteristics, and many special topics related to families' economic circumstances.

The survey design is a series of national panels, each representing the U.S. civilian noninstitutionalized population. Over the years, panels have varied in sample size, number of interview waves, and other features. For the 1984-1993 period, a new panel of households was introduced each February. Subsequent panels have not overlapped; they include a 4-year panel beginning in 1996, a 3-year panel beginning in 2001, a

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[8]This section draws heavily on the discussion of SIPP in Chapter 3 of the panel's interim report (National Research Council, 2010).

TABLE G-2 State-Level Counts of School-Age Children (aged 5-17) in Households Receiving SNAP Benefits, 2009

| State | Total Individuals | | ACS-SNAP QC (Difference) (thousands) | Difference as % of ACS | z |
	ACS (thousands)	SNAP QC (thousands)			
Total	10,041	10,486	−446	−4.4	**−4.7**
Alabama	204	227	−23	−11.1	−2.5
Alaska	20	20	1	3.1	0.3
Arizona	277	276	2	0.6	0.1
Arkansas	121	119	2	1.7	0.4
California	1,011	1,160	−148	−14.6	**−4.3**
Colorado	111	107	5	4.1	0.7
Connecticut	71	67	4	5.0	0.8
Delaware	23	31	−8	−32.8	**−3.1**
District of Columbia	26	27	0	−0.7	−0.1
Florida	540	550	−11	−2.0	−0.5
Georgia	356	405	−48	−13.6	−3.0
Hawaii	26	30	−4	−14.9	−1.5
Idaho	47	46	1	2.4	0.3
Illinois	435	455	−19	−4.4	−1.1
Indiana	214	210	4	1.9	0.4
Iowa	83	85	−2	−2.2	−0.3
Kansas	73	64	9	12.1	1.6
Kentucky	190	204	−14	−7.2	−1.5
Louisiana	234	225	9	3.8	1.0
Maine	47	52	−5	−9.5	−0.9
Maryland	129	135	−6	−4.6	−0.9
Massachusetts	160	170	−10	−6.5	−1.4
Michigan	440	394	46	10.4	2.7
Minnesota	100	99	0	0.5	0.1
Mississippi	150	159	−9	−6.2	−1.4
Missouri	211	229	−17	−8.0	−1.7
Montana	31	25	6	19.1	1.6
Nebraska	48	42	5	11.2	1.5
Nevada	62	60	2	3.0	0.5
New Hampshire	22	20	2	8.5	0.6
New Jersey	142	152	−9	−6.6	−1.2
New Mexico	82	103	−20	−24.7	**−3.7**
New York	617	637	−20	−3.3	−0.7
North Carolina	328	364	−36	−11.0	−2.4
North Dakota	10	13	−3	−33.0	−1.8
Ohio	420	387	32	7.7	2.2
Oklahoma	136	142	−6	−4.4	−0.8
Oregon	162	151	10	6.2	1.1
Pennsylvania	372	384	−12	−3.2	−0.8
Rhode Island	31	29	2	6.0	0.8

TABLE G-2 Continued

State	Total Individuals		ACS-SNAP QC (Difference) (thousands)	Difference as % of ACS	z
	ACS (thousands)	SNAP QC (thousands)			
South Carolina	180	201	–21	–11.5	–2.5
South Dakota	25	22	3	11.0	0.9
Tennessee	276	317	–40	–14.6	**–3.2**
Texas	1,071	1,129	–58	–5.4	–1.8
Utah	66	63	3	3.9	0.5
Vermont	14	18	–4	–29.4	–1.9
Virginia	179	188	–8	–4.6	–0.9
Washington	219	215	5	2.1	0.4
West Virginia	70	81	–12	–16.7	–2.4
Wisconsin	171	174	–3	–1.8	–0.4
Wyoming	7	7	0	–3.6	–0.2

NOTES:
- The ACS-based estimates are of all individuals (aged 5-17) living in households reporting receipt of SNAP benefits and include those living in noninstitutional group quarters. Estimates use person-level weights.
- The SNAP QC-based administrative estimates are of all individuals (aged 5-17) who are members of SNAP filing units. SNAP filing units refer to individuals who together are certified for and receive SNAP benefits. The estimates of individuals also include those who were living with SNAP participants but who were not receiving SNAP benefits if their income and assets were considered in determining the SNAP filing unit's eligibility and benefits.
- The ACS-based poverty levels are based on the povpip variable, which measures the poverty status of the family relative to the census poverty thresholds. The SNAP QC-based poverty levels are based on the tpov variable, which measures the poverty status of the SNAP unit relative to the SNAP poverty guidelines.
- The standard error (SE) for SNAP QC in Wyoming was noted only as less than 500. It was entered at .25 to support computation of the z-statistic.
- The z-statistic is the ACS estimate minus SNAP QC estimate divided by the SE of the difference. A test of the hypothesis that the difference between the ACS and SNAP QC estimates is zero is rejected if z is greater than 3 in absolute value.
- For any individual state, this is at the .1 percent significance level. For testing of all 52 states at the same time, it is at the 5 percent significance level.
- No persons in institutional group quarters are represented in the table.
- ACS = American Community Survey; SE = standard error; SNAP = Supplemental Nutrition Assistance Program (formerly Food Stamp Program); SNAP QC = SNAP Quality Control Data File.

SOURCES: Prepared by the panel using 2009 ACS and FY 2009 SNAP QC estimates provided by Mathematica Policy Research, September 2011.

4-year panel beginning in 2004, and a 4-year panel beginning in 2008. A new, redesigned panel of about the same size as the 2008 panel—45,000 households—is to be introduced in 2013 and followed for 3 or 4 years.

The current SIPP content is built around a "core" of labor force, program participation, and income questions that are repeated at each wave of interviewing, with supplemental topical modules on particular topics being asked one or more times per panel. The survey collects data for each month of a 4-month recall period, with approximately the same number of interviews being conducted in each month of the 4-month period for each wave. Interviews are conducted by personal visit for the first two interview waves and by telephone thereafter, using a computer-assisted interview on a laptop computer. As discussed in Bates and Okon (2003), the 2004 SIPP panel instituted a variety of enhancements to better capture income reporting, including dependent interviewing techniques. The new methods allowed respondent-selected defined periods for reporting job earnings: monthly, biweekly/bimonthly, annually, or hourly. The goal was to make retrieval and reporting more natural and consistent with how respondents typically think about their earnings. In cases where an amount other than monthly was selected, the computer program for the survey internally calculated a gross monthly amount based on pay dates, pay periods, hours worked, paycheck totals, and so on, and performed a variety of checks based on comparisons with answers to past questions, asking respondent to confirm estimated values when there appeared to be potential errors. There are many probes to make sure the respondent has reported all relevant income items for each month. Further the income questions are asked after dates of employment are established, and income then is reported for each spell of employment.

As noted by Moore (2007), "panel surveys generally suffer to some extent from seam bias, the tendency for estimates of change measured across the 'seam' between two successive survey administrations to far exceed change estimates measured within a single interview." The changes in survey methodology that were implemented in the 2004 SIPP were intended to reduce seam bias. Moore compared indications of seam bias in SIPP 2001 with those from the first waves of SIPP 2004 to evaluate the impact of changes to survey methodology in 2004. He reported substantial reductions in seam bias from 2001 to 2004 that are attributable to the new survey methods. [9] "However, notwithstanding the clear improvements, seam bias still afflicts SIPP 2004 panel data. . . ."

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[9] Seam bias generally refers to how a respondent reports a change in status. For example, a respondent who becomes unemployed during a 4-month period is more likely to report that event as occurring during the month of the interview than in the month he became unemployed. Moore (2007) evaluates variables related to change in status. A similar mecha-

Data are currently released in cross-sectional core and topical module files for each interview wave. As of mid-2011, core files were available through wave 2 of the 2008 panel; topical module files were available through wave 8 of the 2004 panel.[10]

The planned redesign of SIPP will change the interviewing cycle from every 4 months to once a year. Each annual interview will include the core question content on income, employment, program participation, and demographic characteristics using an event history calendar to facilitate recollection of monthly information for the previous year. Some content previously in topical modules will be included, and government agencies may pay for special supplements.

Deriving Estimates from the 2004 SIPP Data

The panel calculated percentage eligible for free and for reduced-price meals using the economic units and guidelines described in Appendix B that mirror the special tabulations the panel requested from the Census Bureau. However, in addition to computations based on annual income, we derived estimates based on monthly income under the assumption that eligibility status lasts for a school year. Both estimates were computed with and without accounting for categorical eligibility because of SNAP, TANF, and foster children.

Preparing the Data

The following steps were followed in preparing the SIPP database:

1. Merge people across all waves in the 2004 SIPP. SIPP includes monthly income data from October 2003 through December 2007, although not all data are based on four rotation groups and the full original sample size. (The sample size was reduced by 50 percent beginning with wave 9 in October 2006.[11]) Keep indi-

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nism may result in a respondent reporting an average value or the value for the most recent month for all 4 months of a wave rather than the exact values for each individual month. This type of misreporting should also have been reduced as a result of the methodology enhancements implemented in the 2004 SIPP. The panel, however, is not aware of empirical evidence of this. Pischke (1995) modeled the measurement error in monthly income data in the 1984 SIPP and found that changes in income tended to be reported in the month of the interview.

[10]See http://www.sipp.census.gov/sipp_ftp.html#sipp.

[11]The 2004 SIPP panel underwent a 50 percent sample reduction in wave 9. This occurred during the last wave of interviews in 2006, beginning in October. The first interviews with the smaller sample size collected income information for June through September 2006. Hence, only the data from January 2004 through May 2006 are based on a full set of rotation

viduals in the database if there are data for them for all months of 2004-2005 and most of 2006, so that past year's annual income would be available for each month of 2005 and most of 2006 to match the time pattern of income reported in the ACS for a given calendar year.

2. Keep only households with children aged 5 and up to 15, or aged 15 to 19 (inclusive) enrolled in school but not graduated from high school.[12]

3. Identify foster children and keep them separate from the household in which they reside. They are categorically eligible for free school meals and will be added back into the tabulations later. For each household, create counts of the number of persons in the household (excluding any foster children) and household income (excluding foster child income).

4. Construct economic unit measures EU1-EU5 (see Appendix B) for each household, counting number of persons and summing total personal income for the relevant units. Note that foster children are excluded from these economic unit definitions (and are added in as being categorically eligible for free meals at a later step).

5. Identify the school year associated with the month of the data (for example, income data representing July 2004 through June 2005 would be associated with school year 2004-2005). Assume the guidelines change in July as is typical.

6. For the monthly income measure, use SIPP income reported for that month. Use the guideline associated with the relevant school year. Compute the ratio of monthly income to the guidelines. Also track eligibility throughout the school year, assuming the school year spans September through June and treating July and August as part of the previous school year. Thus children who are income-eligible for free meals during any month of the school year will be eligible for free meals for all subsequent months of the school year. More generally, eligibility established in any month in a school year ensures continued eligibility for the remainder of the school year at that level even if income increases. Note that since the ACS samples are independent across months of the year, one can obtain the right total number of children for a calendar year

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groups. For June 2006, the data are based on three full rotation groups and one reduced-size group. This covers almost two school years: 2004/2005 and 2005/2006, if a school year runs from July of one year to June of the following year. Note that the data set includes these partial panel participants, but the tabulations include information only for those in the data for the relevant calendar year and the preceding calendar year.

[12]In the SIPP, we do not know whether children are in private or public school and know enrollment only for those aged 15-19.

only by including the children from July and August. Keep current monthly eligibility, as well as cumulative monthly eligibility.

7. For the annual income measures, create the previous 12 months' income as the sum of income over those months, and also compute an "inflation"-adjusted income for the previous 12 months to mimic the fact that the ACS adjusts income for inflation to reflect real dollars as of July of the relevant calendar year. (Inflation adjustment factors come from the ACS subject definitions.)[13,14]

8. For each month, for each child in the sample, create indicators for the ratio of economic unit income to the guidelines to reflect eligibility for free, reduced-price, or full-price meals using (1) the ACS adjusted annual income and school year guidelines for second half of calendar year and (2) SIPP monthly income and school year guidelines. Recall that this is income eligibility only, excluding foster children and others categorically eligible but not income-eligible.

9. Construct indicators for uptake of free, reduced-price, or full-price school lunch based on the SIPP question about "usually" getting a lunch. The question is asked only of children aged 5-18. If the respondent says that some children usually get a lunch, then he or she is asked whether the children qualify for free or reduced-price meals under the NSLP.

10. Construct indicators for whether someone in the household has received SNAP benefits or public assistance (presumably mainly TANF) this month, cumulatively over the school year, and in the last calendar year. Create a separate version of the cumulative SIPP and adjusted and unadjusted ACS measures that also accounts for categorical eligibility, adding as eligible for free meals foster children or children in households with SNAP or TANF.

11. Tabulation results use longitudinal weights through 2006, and standard errors and confidence intervals use Taylor series approximations with the Primary Sampling Unit and strata information in the public use files.

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[13]Inflation adjustment factors are the average for the previous calendar year (thus for July 2004, they are the average for July 2003-June 2004). For 2004, they range from 1.90615 to 1.95206. They then need to be translated to dollars for the relevant calendar year. Since the factors are used to inflate 1982 dollars to the current year, they must be multiplied by the average Consumer Price Index Research Series Using Current Methods (CPI-U-RS) for the relevant calendar year and divided by the Current Population Survey Research Series Using Current Methods (CPSU-RS) for 1982 to yield current dollars. For years 2004-2006, they range from close to 1 (in 2006) to around 1.04 (in 2004).

[14]For 2004, for example, they appear at the following link: www.census.gov/acs/www/Downloads/data_documentation/SubjectDefinitions/2004_ACSSubjectDefinitions.pdf.

12. Use the above variables to produce for each month three individual dummy variables for children aged 5-14 or 15 and older, enrolled in school currently, and not a high school graduate, corresponding to each of the economic units. The dummies are 1 if the relevant economic unit income is less than or equal to 130 percent of the guideline, more than 130 percent of the guideline but less than or equal to 185 percent, and more than 185 percent, and are zero otherwise. Foster children are not counted as economic unit members for the rest of that economic unit's calculation. Then, to capture the cumulative nature of the current eligibility process, if a child is eligible for free meals in a given month, free eligibility is carried forward within the school year, and similarly for reduced-price meals. Additional dummy variables are created to reflect both income and categorical eligibility due to receiving SNAP or TANF benefits or being a foster child. In the monthly tabulation, categorical eligibility is determined if someone in the economic unit was receiving SNAP or TANF benefits during the last month. In the annual income tabulations, categorical eligibility is determined if someone in the economic unit was receiving SNAP or TANF benefits during the last calendar year.
13. The microdata also contain child age, race, ethnicity, and gender, along with some other characteristics.

Results

The unit of observation in the tabulations is a child-month. Tabulations represent the mean share of child-months in the sample spent in free, reduced-price, or full-price status. Results are presented for calendar years 2005 and 2006 (so they include part of the 2004-2005 school year, all of 2005-2006, and part of 2006-2007). In the tabulations presented below, only EU4 is used, the economic unit specification adopted by the panel.

Table G-3 illustrates eligibility by category (free, reduced price, and full price) for income eligibility only (IE) and for income and categorical eligibility (IE + cat) based on monthly and annual income for EU4. Results are shown for 2005 and 2006. Eligibility percentages are based on the mean share of child-month eligibility by category for a variety of demographic variables. Table G-3 shows that the annual income eligibility for free meals is almost always below monthly income eligibility, with or without accounting for categorical eligibility. The differences are smaller,[15] however, when we account for categorical eligibility.

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[15]Recall that these results are likely to be conservative (the actual difference may be larger) in the presence of seam bias: for example if respondents tend to report an average of the income they earned during four months instead of actual, more variable, monthly totals.

SCHOOL CHOICE

An underlying assumption of using district and school catchment areas crosswalked to the ACS to estimate eligibility for the school meals programs is that school-age children who attend public school attend in the district and at the school indicated by their address. While this is true for most schoolchildren, such an assumption may introduce error to ACS-based eligibility estimates when students have the option to choose alternatives to their catchment area public school or district.[16] If students eligible for free or reduced-price meals are underrepresented in magnet school enrollments, for example, catchment area estimates will understate the percentage of free or reduced-price-eligible students attending nonmagnet schools. Depending on the relative uptake of school choice alternatives by free or reduced-price-eligible students, catchment area estimates may misrepresent the actual percentage of such students. School districts differentially employ or are otherwise affected by various forms of public school choice, such as magnet schools, charter schools, and intra- and interdistrict open enrollment plans.[17] We refer to these alternatives generically as public schools of choice.

For the purposes of assessing the effects on the ACS Eligibility Option (AEO), it is important to distinguish between intra- and interdistrict public school choice. Many districts may find the AEO appealing at the district level, in which case intradistrict choice plans will have no effect. Whether free or reduced-price-eligible students are drawn disproportionately to schools of choice (e.g., open enrollment, magnet, or district charter schools) will not affect the overall percentage of these children in the district. As a result, school choice will not pose a problem for ACS estimates. However, if students leave the district—for example, to attend an independent charter school—or are eligible for an interdistrict choice plan, and if free or reduced-price-eligible students choose these options differentially, then ACS estimates will misrepresent the percentage of free or reduced-price-eligible students attending district schools. A similar issue arises if a district is interested in employing the AEO only at some schools within the district. In this case, both intra- and interdistrict choice are potentially problematic, as the ACS estimates of the percentage of eligible children in any school based on residence may misrepresent actual attendance.

The panel used information from one of the case study districts— Omaha, data from the District of Columbia, and the Common Core of

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[16]This discussion is limited to non-home-schooling public school alternatives because the ACS identifies two categories of students: (1) those attending public school or college and (2) those attending private school or college or being home schooled.

[17]This includes a variety of alternatives, such as the option that some districts offer students to choose among some or all high schools in the district (e.g., New York City) or the ability to attend out-of-district public schools.

TABLE G-3 Percentage Eligible by Category for Various
Demographic Characteristics Using Monthly and Annual Income

Group	Year	Type of Eligibility	Monthly Free (%)
All Students	2005	IE	30
All Students	2005	IE + cat	33
All Students	2006	IE	28
All Students	2006	IE + cat	31
Student Age			
5 to 11	2005	IE	31
5 to 11	2005	IE + cat	35
12 to 14	2005	IE	29
12 to 14	2005	IE + cat	33
14 to 18	2005	IE	26
14 to 18	2005	IE + cat	29
Citizenship			
Citizen	2005	IE	29
Citizen	2005	IE + cat	32
Noncitizen	2005	IE	46
Noncitizen	2005	IE + cat	49
Education of Householder			
No HS degree	2005	IE	63
No HS degree	2005	IE + cat	69
HS grad.	2005	IE	38
HS grad.	2005	IE + cat	42
Some college	2005	IE	26
Some college	2005	IE + cat	29
College grad.	2005	IE	13
College grad.	2005	IE + cat	15
Metro vs. Nonmetro			
Metro	2005	IE	29
Metro	2005	IE + cat	32
Nonmetro	2005	IE	34
Nonmetro	2005	IE + cat	37
Census Region			
New England	2005	IE	21
New England	2005	IE + cat	24
Middle Atlantic	2005	IE	28
Middle Atlantic	2005	IE + cat	31
East North Central	2005	IE	28
East North Central	2005	IE + cat	31
West North Central	2005	IE	24
West North Central	2005	IE + cat	27
South Atlantic	2005	IE	29
South Atlantic	2005	IE + cat	32
East South Central	2005	IE	38
East South Central	2005	IE + cat	44
West South Central	2005	IE	36
West South Central	2005	IE + cat	40
Mountain	2005	IE	29
Mountain	2005	IE + cat	32
Pacific	2005	IE	30
Pacific	2005	IE + cat	33

SOURCE: Prepared by the panel using the 2004 Survey of Income and Program Participation.

Monthly Reduced Price (%)	Monthly Full Price (%)	Annual Free (%)	Annual Reduced Price (%)	Annual Full Price (%)
12	58	21	13	66
11	56	28	10	63
13	59	20	14	66
12	58	27	11	63
13	56	23	13	64
11	54	30	10	60
12	59	22	12	66
10	57	27	9	63
12	62	18	12	70
10	61	24	9	67
12	59	21	12	67
10	57	27	9	63
19	35	36	21	44
18	34	41	18	41
16	21	54	19	27
12	18	65	13	22
16	47	28	17	55
13	45	37	13	51
14	60	18	13	69
13	58	24	10	66
7	80	7	6	87
6	79	10	5	85
12	60	21	12	67
10	58	27	9	64
14	52	25	14	61
12	51	32	10	58
10	69	16	8	76
8	68	21	6	73
12	61	21	11	68
10	59	27	9	64
12	60	21	12	67
11	59	27	8	64
11	65	17	10	73
10	64	22	8	70
13	57	22	13	65
12	56	27	10	63
12	50	29	13	58
9	47	40	8	52
15	49	26	16	58
12	48	33	12	55
12	58	19	15	66
11	57	25	11	63
12	58	20	13	67
10	57	26	10	63

Data to better understand the nature and extent of the problem potentially introduced by school choice. In this regard, we investigated the following research questions:

- Are various forms of school choice sufficiently popular to warrant concern?
- If so, where lies and what is the nature of the potential problem?
- Are ACS estimates potentially misleading?

Based on this analysis, the panel offers recommendations regarding the implications of the issue of school choice for the implementation of the AEO.

Potential Effects of School Choice on ACS Estimates

To explore the potential effects of school choice on estimates of free or reduced-price-eligible students, the panel assembled data from two school districts with differing forms of public school choice that allowed us to compare estimates of the percentage of free or reduced-price-eligible students based on statistics reflecting catchment area residence with the percentage of free or reduced-price-eligible students who actually enroll in schools following choice decisions. We examined the case of inter-district school choice in Washington, DC, followed by a within-district open enrollment plan in Omaha, Nebraska. For the District of Columbia, we received aggregate school data from Umut Ozek, a researcher at the Center for Analysis of Longitudinal Data in Education Research at the American Institutes of Research that allowed us to construct the analysis described below. The analysis for Omaha is based on data provided to the panel by the Omaha school district.

In 2008, Washington, DC, had 60 independent charter schools, schools that were not part of the District of Columbia Public School (DCPS) District, which has 140 schools. Thirty-six percent of all public school students residing in the District of Columbia attended a charter school that was not part of DCPS. This, then, is a case in which estimating free or reduced-price-eligible students with the ACS may be misleading at both the district and school levels. For each DCPS school, Figure G-1 shows the percentage of students eligible for free or reduced-price meals based on the school's catchment area versus the school's enrolled students. If the catchment area percentage of eligible students equals the percentage of eligible students who are actually enrolled, that school will lie along the 45° diagonal. Most schools deviate from the 45° diagonal, indicating that catchment area estimates will both over- and underrepresent eligiblity percentages based on enrolled students. A simple unweighted mean dif-
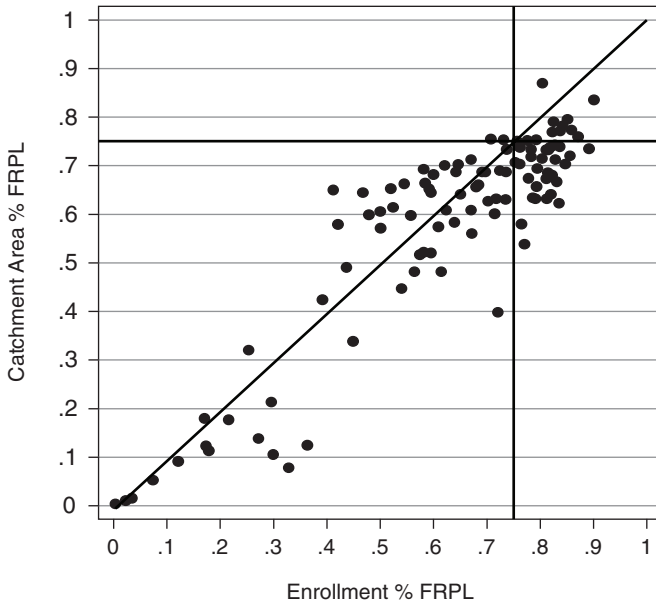
FIGURE G-1 Out-of-district public enrollment, Washington, DC, public schools, 2008: School catchment-based and enrollment-based free or reduced-price-eligible percentages.
NOTE: FRPL = free or reduced-price lunch.
SOURCE: Prepared by the panel from summary data provided by Umut Ozek, CALDER, American Institutes of Research.

ference between schools' catchment area percentage of free or reduced-price lunch eligibility and the free or reduced-price eligibility percentage based on enrolled students indicates that catchment area eligibility rates understated the enrollment-based eligibility rates by 6.5 percentage points in 2008. This finding is consistent with a situation in which free or reduced-price-eligible students are less likely to opt for charter schools than their economically more advantaged peers. In this situation, the AEO potentially appears less attractive to the district than would be the case if eligibility based on enrolled students were known.

A similar analysis pertains to individual schools. Differences that may be most important occur near the 75 percent free or reduced-price eligibility level, where it may be viable to offer free meals to all students. For example, the ACS or another residence-based source of eligibility estimates may provide misleading information if it signals that free or reduced-price eligibility is either above or below 75 percent when the reverse is true

according to enrolled students. In Figure G-1, instances of these situations occur in the northwest and southeast quadrants created by the 75 percent dashed lines, whereas schools in the northeast quadrant are likely to consider the AEO under either a catchment area (e.g., ACS) estimate or one employing actual enrollment. Only 2 percent of schools are found in the northwest quadrant, while 29 percent of schools are in the southeast quadrant. Using catchment area estimates of free or reduced-price eligibility, these schools in the southeast quadrant will be less likely to opt for the AEO than if they use enrollment-based percentages. Both methods yield eligibility estimates exceeding the benchmark of 75 **percent for the 11 per**cent of DCPS schools in the northeast quadrant. It is clear from the case of DCPS that the calculations based on catchment areas can, in some cases, substantially underestimate enrollment-based percentages. Of the schools whose enrollment-based percentage exceeds 75 percent free or reduced-price-eligible, 45 percent have catchment area estimates that differ from actual enrollment percentages by more than 10 percentage points.

Because such a large share of public school students residing in the District of Columbia attend independent charter schools, it is likely that the District is among the more extreme examples of how choice influences the accuracy of catchment area estimates. That, however, is an empirical question dependent on the availability of public school choice, which, as is discussed in more detail below, is limited to a relatively few districts, and on the differential use of schools of choice by free or reduced-price-eligible and ineligible students. At the district level, catchment area eligibility percentages will differ from enrollment-based eligibility percentages only when interdistrict public school choice is available and is utilized differentially by eligible and ineligible students. At the school level, any type of public school choice is potentially problematic.

Omaha has an open enrollment plan for all of its 59 elementary, 11 middle, and 7 high schools. Students can choose to attend any grade-appropriate school in the district. If students sort to schools based on free or reduced-price eligibility, we will expect to find that catchment area-based free or reduced-price eligible percentages differ from their enrollment-based counterparts. Using data provided by the Omaha school district on students grouped by catchment area and where they actually attend school, Figure G-2 summarizes how the catchment area and enrollment-based percentages differ for each school in the district. Many schools are near the 45° diagonal, indicating small differences. However, 20 percent of the schools have catchment-based free or reduced-price-eligible percentages that differ from their enrollment-based counterparts by at least 10 percentage points.

Two aspects of this analysis are important. First, all of these school choices are within-district choices and will not affect Omaha's decision
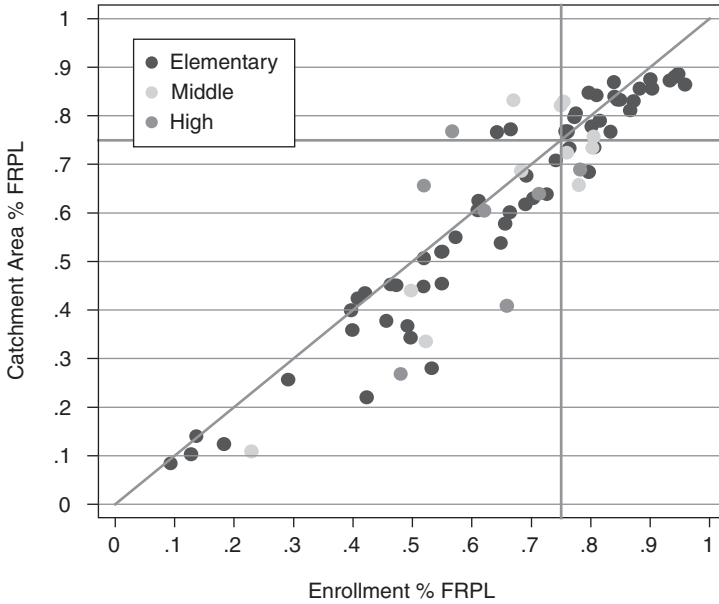
FIGURE G-2 Within-district open enrollment in Omaha public schools, 2008-2009: School catchment-based and enrollment-based free or reduced-price-eligible percentages.
NOTE: FRPL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

to adopt the AEO at the district level because its overall free or reduced-price-eligible percentage does not change as a result of its districtwide open enrollment plan. Second, even at the school level, differences may not matter because many pertain to schools with free or reduced-price-eligible percentages too low for the AEO to be considered. Seven percent of the schools are in the northwest quadrant, indicating that although the catchment area-based free or reduced-price-eligibility percentage exceeds 75, the free or reduced-price-eligibility percentage based on enrolled students is less than 75. The reverse is true for the 9 percent of schools found in the southeast quadrant. Contrast these with the 31 percent of schools in the northeast quadrant that would be correctly classified as exceeding 75 percent under both measures. These results are summarized in the first row of Table G-4. Compared with the misclassification relative to the 75 percent free or reduced-price-eligibility found in the District of Columbia (31 percent in the northwest and southeast quadrants), misclassification in Omaha is much lower (16 percent).

TABLE G-4 Percentage of Schools in Omaha, Nebraska, According to Whether Free or Reduced-Price-Eligibility Percentage Is Over or Under 75 Percent, by Measure

Measure	% in Southwest Quadrant	% in Northwest Quadrant	% in Southeast Quadrant	% in Northeast Quadrant
First Measure	< 75	< 75	≥ 75	≥ 75
Second Measure	< 75	≥ 75	< 75	≥ 75
Enrollment vs. Catchment	53.5	6.5	9.1	31.2
ACS vs. Catchment	60.0	10.7	4.0	25.3
Enrollment vs. ACS	54.7	6.7	16.0	22.7

NOTE: An "enrollment" measure is an administrative estimate—provided by the district—based on where students are enrolled. A "catchment" measure is an administrative estimate—provided by the district—based on where students reside in terms of school catchment areas. "ACS" denotes an estimate from the American Community Survey, which is based on residence.
SOURCE: Prepared by the panel.

In assessing the potential impact of intradistrict school choice on the use of the AEO, it is also useful to consider the ACS 5-year estimates for Omaha schools and how they differ from the catchment- and enrollment-based data provided by the Omaha school district. Assume that Omaha's administrative estimates accurately reflect the location and free or reduced-price eligibility of students and that deviations from these estimates represent errors by the ACS. The second row of Table G-4 compares the ACS estimates of eligibility percentages for a catchment area with those from the Omaha school district. Presumably, both are attempting to identify the same thing—the catchment area-based free or reduced-price-eligibility percentage. The middle two columns represent instances of misclassification (over vs. under 75 percent). Fifteen percent of the schools will receive different classifications depending on whether the ACS or the administrative catchment area estimates are employed. As noted in the body of the report, the panel finds that ACS estimates are biased downward. In Omaha, we find that an unweighted mean of the ACS estimates of free and reduced-price lunch eligibility is 7.9 percentage points smaller than the corresponding administrative estimate derived from enrollment-based data. This is also indicated in the second row of Table G-4 derived using catchment area-based administrative data, which shows that it is much more likely that the ACS incorrectly classifies a school as below the 75 percent threshold (10.7 percent) than above it (4.0 percent). This highlights the potential measurement problems when ACS estimates are employed at the school level. The final row of Table G-4 shows the dif-

ference between the Omaha estimates of free or reduced-price-eligible percentages for schools based on enrolled students and what would be obtained from the ACS, which includes the measurement errors associated with ACS estimates, as well as errors introduced by the presence of school choice. In this instance, the misclassifications introduced by using catchment area enrollment (first row, 16 percent) are roughly comparable to the total misclassification of catchment area enrollment introduced by the ACS (second row, 15 percent), although the composition of errors differs. Taken together, issues of measurement error and school choice (third row) lead to a misclassification of 23 percent of schools when ACS estimates are employed.

Figure G-3 compares the school-level percentages of free or reduced-price-eligible students enrolled in Omaha schools with the ACS 5-year (2005-2009) estimates (third row of Table G-4). As expected, there is much greater variation around the 45° diagonal than was found in Figure G-2, owing to both the sampling error associated with the ACS estimates and the fact that 5-year estimates are used to approximate the 2008-2009 per-
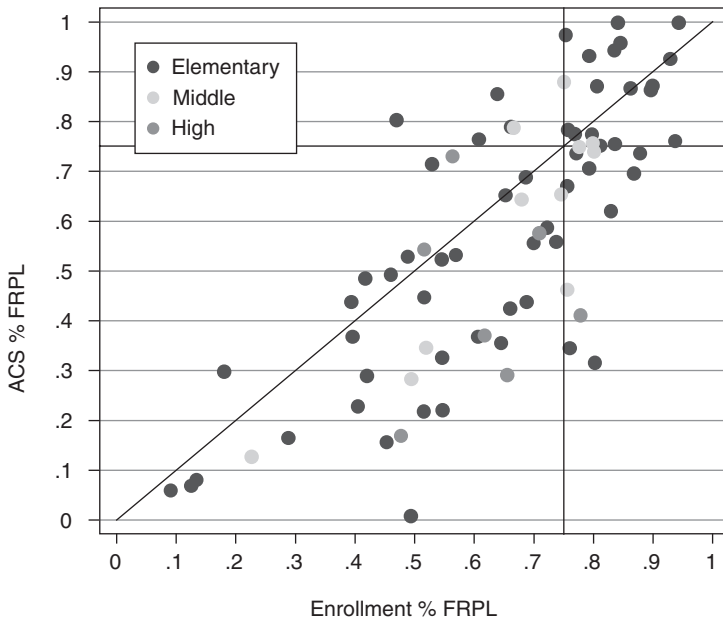

FIGURE G-3 Five-year (2005-2009) ACS-estimated and 2008-2009 actual enrollment by free or reduced-price-eligibility percentages, Omaha public schools.
NOTE: FRPL = free or reduced-price lunch.
SOURCE: Prepared by the panel.

centages. As a result, ACS estimates are more likely to misclassify schools as over or under 75 percent free or reduced-price eligibility, as shown in the third row of Table G-4.

The analysis of the effect of school choice in the District of Columbia Public Schools and the Omaha School District demonstrates that in some instances, school choice may introduce error into free or reduced-price-eligibility estimates from the ACS. Although two observations provide little room for generalization, the analysis suggests that intradistrict choice such as that found in Omaha may be much less problematic than the interdistrict choice found in a district where a very high percentage of students attend charter schools. The panel found that misclassifications near the free or reduced-price-eligibility percentage of 75 percent that may trigger consideration of the AEO were much greater in the District of Columbia (31 percent) than in Omaha (16 percent). We next explore the prevalence of various types of school choice.

Prevalence of School Choice

It is difficult to find summaries of public school choice that are detailed with respect to both forms of school choice and geography. In 2007-2008, it is estimated that nationwide, magnet schools enrolled 4.3 percent of regular public school students, while there were 4,388 charter schools enrolling about 2.7 percent of regular public school students.[18] Twenty states have mandatory intradistrict open enrollment policies that allow students to transfer to other schools within the public school district; 14 states have mandatory interdistrict open enrollment policies.[19] Many of the mandatory intradistrict policies allow students to leave low-performing schools as a remedy for the schools having failed to meet the No Child Left Behind Act of 2004 Adequate Yearly Performance targets.

Employing a database developed by the panel from the Common Core of Data for recent years, Table G-5 provides a summary of the prevalence of various types of schools of choice for the most recently available years.[20] As previously mentioned, charter schools can be created as schools within an existing local education agency (LEA) that also has traditional public schools, or they can receive a charter as an independent LEA that includes only one or more charter schools. We refer to the former as dis-

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[18]Schools: http://nces.ed.gov/programs/digest/d09/tables/dt09_097.asp; enrollments: http://nces.ed.gov/pubs2010/2010305/tables/table_03.asp.

[19]These data were taken from the National Center for Education Statistics (NCES) website on school choice policies (Table 4.2) on May 22, 2011.

[20]These data differ modestly from the publicly available data in the Common Core of Data as the panel included only districts that were in the Census Bureau's geographic database, and thus those for which the Bureau could derive ACS estimates.

TABLE G-5 Share of Public School Enrollment by Choice Status

School Year	Regular	District Charter	Independent LEA Charter	Magnet
2004-2005	0.933	0.017	0.024	0.026
2005-2006	0.927	0.018	0.025	0.030
2006-2007	0.928	0.020	0.026	0.026
2007-2008	0.923	0.021	0.027	0.030
2008-2009	0.915	0.022	0.030	0.033

NOTES: LEA = local education agency. Regular schools may include open enrollment schools. District charters are charters under the administration of the local LEA. Independent charters are separate LEAs, not part of the local LEA.
SOURCE: Prepared by the panel.

trict charters and the latter as independent LEA charters. As noted above, independent charters are potentially more problematic for use of the AEO as they represent a form of interdistrict choice and thus can affect both district-level and school-level decisions to opt for the AEO. The panel was unable to find national data documenting the prevalence of open enrollment schools and thus cannot comment on its potential impact.

Although potentially problematic when it occurs, school choice currently raises limited concerns, on average, regarding the use of the ACS for estimating eligibility for free and reduced-price school meals. In 2008-2009, fewer than 15 percent of counties in the United States contained either a charter or magnet school (panel database). However, because charter and magnet schools are much more prevalent in urban areas, they accounted for about 9 percent of all enrollment. Thus, although charters and magnets are not common in most areas, they can enroll a large number of students in some places. For example, charter or magnet school enrollment accounted for more than 10 percent of public school enrollment in 92 counties in 2008-2009 (panel database). Charter schools that are independent LEAs accounted for more than 20 percent of enrollment in just 9 counties in 2008-2009, including Washington, DC (35 percent), St. Louis (25 percent), and New Orleans (55 percent) (panel database). Thus for a very limited set of districts, the ACS may provide misleading estimates of eligibility for free or reduced-price meals.

Summary

The above analysis suggests the following:

- School choice is not sufficiently pervasive to cause concern for use of the ACS to estimate free or reduced-price eligibility for the AEO in most schools and school districts.

- In an important subset of schools and districts, however, attendance at noncatchment area schools occurs frequently enough that these districts should carefully consider the likely difference between the ACS free or reduced-price-eligibility estimates and estimates based on actual enrollment.
  — At the district level, this occurs when a substantial portion of students have exercised the ability to choose schools that are not part of the LEA, such as charter schools in independent LEAs.
  — At the school level, this occurs when a relatively large percentage of students have chosen to attend noncatchment area schools.

IMPUTATION FOR ITEM NONRESPONSE

Using the 2008 ACS Public Use Microdata Sample (PUMS) file, the panel developed the following tabulations of income eligibility; reporting of SNAP benefits and public assistance income; and imputation flags for (1) any income item, (2) SNAP, and (3) public assistance income. Tabulations included income eligibility for the school meals programs for all related and unrelated students and excluded foster children. Income eligibility used household income and household size. There were seven tabulations:

1. income eligibility for all students;
2. income eligibility for all students in households where some income item was imputed;
3. income eligibility for all students in households that were receiving SNAP benefits;
4. income eligibility for all students in households that were receiving SNAP benefits and for which SNAP was imputed;
5. income eligibility for all students in households that were receiving SNAP benefits and for which income was imputed;
6. income eligibility for all students in households where some resident reported public assistance income; and
7. income eligibility for all students in households where some resident reported public assistance income, and welfare income was imputed for some resident.

Table G-6 shows results for the United States. In the United States, 28.8 percent of households with students had some income imputed, .2 percent had SNAP benefits imputed, and 1.0 percent had public assistance income imputed. Of the households receiving SNAP benefits,

TABLE G-6 Eligibility Distribution for Households with Students, Selected Characteristics

Household Characteristic	Eligibility			Percentage of All Students
	Percentage Free	Percentage Reduced Price	Percentage Full Price	
With Students	22.51	11.70	65.79	
With Students, Some Income Imputed	22.80	13.28	63.92	28.80
With Students and SNAP	68.81	13.72	17.48	17.39
With Students, SNAP, and SNAP Imputed	65.00	10.67	24.33	0.20
With Students, SNAP, and Some Income Imputed	54.77	17.34	27.89	5.87
With Students and Public Assistance	65.24	13.05	21.71	4.92
With Students, Public Assistance, and Public Assistance Imputed	54.44	15.55	30.01	0.99

SOURCE: Prepared by the panel using 2008 ACS Public Use Microdata Sample (PUMS) data.

almost 6 percent had SNAP benefits imputed, and of the households that had someone receiving public assistance income, 20 percent had someone with public assistance income imputed.

Note that in the households receiving SNAP benefits or public assistance income, most students (68.8 percent and 65.2 percent, respectively) were already income-eligible for school meals. Previous tabulations show that accounting for SNAP (but not public assistance) increases the percentage eligible for free meals by 5.4 percent, accounting for public assistance (but not SNAP) increases the percentage eligible for free meals by 1.7 percent, and accounting for both increases the percentage eligible for free meals by 6.1 percent. Comparing rows in Table G-6 shows the impact of imputation on the eligibility percentages for the school meals programs. For example, the eligibility percentages in the third and fourth rows show the impact of imputation of SNAP benefits. Imputation of SNAP benefits (fourth row) tends to increase the percentage eligible for full-price meals while decreasing the percentages eligible for free and for reduced-price meals. However, this will have a minor impact on the eligibility distribution for all students because SNAP is imputed for only .2 percent of them. Comparing the eligibility percentages in the sixth and seventh rows shows the impact of imputation of public assistance income

among households that report receiving such income. The imputation of public assistance income tends to overstate eligibility for reduced- and full-price meals and understate eligibility for free meals. Since only 1 percent of all students live in households where public assistance income is imputed, however, this will have little impact on the overall eligibility distribution. Finally, a comparison of the third and fifth rows shows that for SNAP households with students, income imputation (for any source of income) tends to overstate the full-price- and reduced-price-eligibility percentages and understate the free eligibility percentage. Since roughly one-third of households that report receiving SNAP benefits have some income imputed, this could be a more significant issue. However, because the panel has chosen to use the ACS variables on SNAP benefits and public assistance income to determine categorical eligibility, the children misclassified by income imputation will be correctly assigned as eligible for free meals because of SNAP participation.

CERTIFICATION ERRORS

As described in Chapter 2, the Access, Participation, Eligibility, and Certification Study (APEC) (U.S. Department of Agriculture/Food and Nutrition Service, 2007b) provided national estimates for the percentage of students who were misclassified by eligibility category in 2005-2006. These certification errors are reproduced in Table G-7. The first three values, for example, indicate that among students certified for free meals, 86.0 percent were actually eligible for free meals, 8.1 percent were actu-

TABLE G-7 Certification Category and Correct Eligibility Category in School Year 2005-2006

Certification Category	Correct Eligibility Category	As a Percentage of Certification Category
Free	Free	86.0
Free	Reduced price	8.1
Free	Full price	5.9
Reduced Price	Free	34.0
Reduced Price	Reduced price	40.9
Reduced Price	Full price	25.1
Full Price	Free	19.0
Full Price	Reduced price	16.6
Full Price	Full price	64.4

SOURCE: U.S. Department of Agriculture/Food and Nutrition Service (2007b) also called the APEC study.

ally eligible for reduced-price meals, and 5.9 percent were eligible only for full-price meals. The APEC certification errors apply to all certified students (including those directly certified) and denied applicants; they do not apply to students whose families did not apply for benefits. While it is likely that most of these students were not eligible for free or reduced-price meals, some may have been, and there is no current information about the percentage of eligible students who do not apply. Accordingly, the panel considered a range of assumptions to help illuminate the potential impact of these errors on differences between ACS eligibility estimates and administrative data on certification.

The panel used the APEC certification errors (reproduced in Table G-7) to evaluate the potential impact of certification errors on eligibility estimates for a variety of assumptions. These are illustrated in Tables G-8 through G-12. Each table shows the impact of certification errors for 13 free, reduced-price, and full-price certification distributions. In forming these distributions, the percentage certified as eligible for free meals was varied from 45 percent to 90 percent in increments of 5 percent, and the percentage certified for reduced-price meals assumed values of 5 percent, 10 percent, or 15 percent. As a result, the percentage full-price eligible ranged from 40 percent to 5 percent. In addition, three assumptions are displayed for the percentage of enrolled students who applied for benefits and were denied: 10 percent (Tables G-8 and G-11), 25 percent (Tables G-9 and G-12), and 40 percent (Table G-10). Finally, two different assumptions were made concerning the eligibility status of students who did not apply: either they were all assumed to be eligible only for full-price meals (Tables G-8 through G-10), or 9.5, 8.3, and 82.2 percent were assumed to be eligible for free, reduced-price, and full-price meals, respectively (Tables G-11 and G-12).

Results were evaluated on both the eligibility percentages and the blended reimbursement rate (BRR) implied by the eligibility percentages. Table G-8 shows that if the percentage of enrolled students who applied for benefits and were denied is 10 percent, and all who did not apply were eligible only for full-price meals, then certification errors result in an overstatement of the BRR by 6-7 percent across all 13 certification distributions. For the highest-percentage free- and reduced-price-eligible districts shown in the table, the overstatement of the BRR remains at 6-7 percent as the percentage of enrolled students who applied and were denied increases to 25 percent (see Table G-9) or 40 percent (see Table G-10). Under these assumptions, however, for districts with low percentages free and reduced-price eligible, the overstatement of the BRR is reduced to 3 percent under the 25 percent assumption (see Table G-9) and to 0 percent under the 40 percent assumption (see Table G-10).

As shown in Tables G-11 and G-12, the assumption that some of the

TABLE G-8 Illustration of Impact on BRR of Two Assumptions: (1) 10 Percent of Students Who Must Pay Full Price Applied for but Were Denied Approval for Free or Reduced-Price Meals and (2) Students Who Did Not Apply Were Not Eligible for Free or Reduced-Price Meals

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Alternative Distributions of Certified Students (%)													
Free	45	50	55	60	60	65	70	70	75	80	80	85	90
Reduced Price	15	10	15	10	15	10	5	15	10	5	15	10	5
Full Price	40	40	30	30	25	25	25	15	15	15	5	5	5
Distributions of Eligible Students, Corrected for Certification Error (%)													
Free	45	47	53	56	57	60	62	66	68	71	74	77	79
Reduced Price	10	9	11	9	11	10	8	12	10	9	13	11	9
Full Price	45	44	36	35	31	30	29	22	21	20	13	12	11
BRRs													
BRR, Certified Students ($)	1.60	1.62	1.83	1.85	1.95	1.97	1.99	2.18	2.20	2.22	2.41	2.43	2.45
BRR, Eligible Students ($)	1.50	1.53	1.71	1.74	1.81	1.84	1.87	2.02	2.05	2.08	2.23	2.26	2.29
Difference (E – C) ($)	–0.10	–0.09	–0.12	–0.11	–0.14	–0.13	–0.12	–0.16	–0.15	–0.14	–0.18	–0.18	–0.17
Percentage Difference $\left(\dfrac{E-C}{C}\right)$	–6	–6	–7	–6	–7	–6	–6	–7	–7	–6	–8	–7	–7

NOTE: BRR = blended reimbursement rate.
SOURCE: Prepared by the panel.

TABLE G-9 Illustration of Impact on BRR of Two Assumptions: (1) 25 Percent of Students Who Must Pay Full Price Applied for but Were Denied Approval for Free or Reduced-Price Meals and (2) Students Who Did Not Apply Were Not Eligible for Free or Reduced-Price Meals

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Alternative Distributions of Certified Students (%)													
Free	45	50	55	60	60	65	70	70	75	80	80	85	90
Reduced Price	15	10	15	10	15	10	5	15	10	5	15	10	5
Full Price	40	40	30	30	25	25	25	15	15	15	5	5	5
Distributions of Eligible Students, Corrected for Certification Error (%)													
Free	46	48	54	56	58	60	63	66	69	71	74	77	79
Reduced Price	11	10	12	10	12	10	9	12	11	9	13	11	10
Full Price	43	42	34	33	30	29	28	22	21	20	13	12	11
BRRs													
BRR, Certified Students ($)	1.60	1.62	1.83	1.85	1.95	1.97	1.99	2.18	2.20	2.22	2.41	2.43	2.45
BRR, Eligible Students ($)	1.55	1.57	1.74	1.77	1.84	1.87	1.90	2.04	2.07	2.10	2.23	2.26	2.29
Difference (E − C) ($)	−0.05	−0.04	−0.09	−0.08	−0.11	−0.10	−0.09	−0.14	−0.13	−0.12	−0.18	−0.17	−0.16
Percentage Difference $\left(\dfrac{E-C}{C}\right)$	−3	−3	−5	−4	−5	−5	−4	−7	−6	−6	−7	−7	−7

NOTE: BRR = blended reimbursement rate.
SOURCE: Prepared by the panel.

TABLE G-10 Illustration of Impact on BRR of Two Assumptions: (1) 40 Percent of Students Who Must Pay Full Price Applied for but Were Denied Approval for Free or Reduced-Price Meals and (2) Students Who Did Not Apply Were Not Eligible for Free or Reduced-Price Meals

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Alternative Distributions of Certified Students (%)													
Free	45	50	55	60	60	65	70	70	75	80	80	85	90
Reduced Price	15	10	15	10	15	10	5	15	10	5	15	10	5
Full Price	40	40	30	30	25	25	25	15	15	15	5	5	5
Distributions of Eligible Students, Corrected for Certification Error (%)													
Free	47	49	55	57	59	61	64	66	69	72	74	77	79
Reduced Price	12	11	13	11	13	11	9	13	11	10	13	11	10
Full Price	41	40	33	32	29	28	27	21	20	19	13	12	11
BRRs													
BRR, Certified Students ($)	1.60	1.62	1.83	1.85	1.95	1.97	1.99	2.18	2.20	2.22	2.41	2.43	2.45
BRR, Eligible Students ($)	1.59	1.62	1.78	1.81	1.87	1.90	1.93	2.06	2.08	2.11	2.24	2.27	2.30
Difference (E − C) ($)	−0.01	0.00	−0.05	−0.05	−0.08	−0.07	−0.06	−0.13	−0.12	−0.11	−0.17	−0.16	−0.16
Percentage Difference $\left(\dfrac{E-C}{C}\right)$	0	0	−3	−2	−4	−4	−3	−6	−5	−5	−7	−7	−6

NOTE: BRR = blended reimbursement rate.
SOURCE: Prepared by the panel.

TABLE G-11 Illustration of Impact on BRR of Two Assumptions: (1) 10 Percent of Students Who Must Pay Full Price Applied for but Were Denied Approval for Free or Reduced-Price Meals and (2) 9.5 Percent of Students Who Did Not Apply Were Eligible for Free Meals and 8.3 Percent for Reduced-Price Meals

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Alternative Distributions of Certified Students (%)													
Free	45	50	55	60	60	65	70	70	75	80	80	85	90
Reduced Price	15	10	15	10	15	10	5	15	10	5	15	10	5
Full Price	40	40	30	30	25	25	25	15	15	15	5	5	5
Distributions of Eligible Students, Corrected for Certification Error (%)													
Free	48	51	56	58	59	62	65	67	69	72	74	77	80
Reduced Price	13	12	13	12	13	12	10	13	12	10	13	11	10
Full Price	39	38	31	30	27	26	25	20	19	18	13	12	11
BRRs													
BRR, Certified Students ($)	1.60	1.62	1.83	1.85	1.95	1.97	1.99	2.18	2.20	2.22	2.41	2.43	2.45
BRR, Eligible Students ($)	1.64	1.67	1.81	1.84	1.90	1.93	1.96	2.07	2.10	2.13	2.25	2.28	2.30
Difference (E − C) ($)	0.04	0.05	−0.02	−0.01	−0.05	−0.04	−0.03	−0.11	−0.10	−0.09	−0.17	−0.16	−0.15
Percentage Difference $\left(\dfrac{E-C}{C}\right)$	2	3	−1	−1	−3	−2	−2	−5	−5	−4	−7	−7	−6

NOTE: BRR = blended reimbursement rate.
SOURCE: Prepared by the panel.

TABLE G-12 Illustration of Impact on BRR of Two Assumptions: (1) 25 Percent of Students Who Must Pay Full Price Applied for but Were Denied Approval for Free or Reduced-Price Meals and (2) 9.5 Percent of Students Who Did Not Apply Were Eligible for Free Meals and 8.3 Percent for Reduced-Price Meals

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Alternative Distributions of Certified Students (%)													
Free	45	50	55	60	60	65	70	70	75	80	80	85	90
Reduced Price	15	10	15	10	15	10	5	15	10	5	15	10	5
Full Price	40	40	30	30	25	25	25	15	15	15	5	5	5
Distributions of Eligible Students, Corrected for Certification Error (%)													
Free	49	51	56	59	60	62	65	67	70	72	74	77	80
Reduced Price	14	12	14	12	14	12	10	13	12	10	13	11	10
Full Price	38	37	30	29	27	26	25	20	19	18	12	11	10
BRRs													
BRR, Certified Students ($)	1.60	1.62	1.83	1.85	1.95	1.97	1.99	2.18	2.20	2.22	2.41	2.43	2.45
BRR, Eligible Students ($)	1.66	1.69	1.83	1.86	1.91	1.94	1.97	2.08	2.11	2.14	2.25	2.28	2.31
Difference (E − C) ($)	0.06	0.07	0.00	0.01	–0.03	–0.03	–0.02	–0.10	–0.09	–0.08	–0.16	–0.16	–0.15
Percentage Difference $\left(\dfrac{E-C}{C}\right)$	4	4	0	0	–2	–1	–1	–5	–4	–4	–7	–6	–6

NOTE: BRR = blended reimbursement rate.
SOURCE: Prepared by the panel.

students who did not apply were eligible for free or reduced-price meals does not change the overstatement of the BRR for districts with very high free and reduced-price eligibility percentages. For districts with lower levels of eligibility, however, the impact is more dramatic, even contributing to an understatement of the BRR.

Appendix H

Biographical Sketches of Panel Members and Staff

ALLEN L. SCHIRM (*Chair*) is vice president and director of human services research at Mathematica Policy Research. His principal research interests include small-area estimation, census methods, and sample and evaluation design, with application to studies of child well-being and welfare, food and nutrition, and education policy. For the National Research Council Committee on National Statistics, he has served on the Panel on the Design of the 2010 Census Program of Evaluations and Experiments, the Panel on Research on Future Census Methods, the Panel on Formula Allocations, and the Panel on Estimates of Poverty for Small Geographic Areas. He is a fellow of the American Statistical Association and was recently chair of its Social Statistics Section. Dr. Schirm holds an A.B. in statistics from Princeton University and a Ph.D. in economics from the University of Pennsylvania.

DAVID M. BETSON is an associate professor of economics and public policy in the College of Arts and Letters and former director of the Hesburgh Program in Public Service at the University of Notre Dame. He is a research affiliate with the Institute for Research on Poverty at the University of Wisconsin and the Joint Center for Poverty Research at the University of Chicago and Northwestern University. His previous positions have been at the Institute for Research on Poverty at the University of Wisconsin and the U.S. Department of Health, Education, and Welfare. At the National Research Council, he has been involved in many activities of the Committee on National Statistics, including the Planning

Group for the Workshop to Assess the Current Status of Actions Taken in Response to *Measuring Poverty: A New Approach*; the Panel on Estimates of Poverty for Small Geographic Areas; the Panel on Evaluation of USDA's Methodology for Estimating Eligibility and Participation for the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Program, for which he served as chair; the Panel on Poverty and Family Assistance; and the Panel to Evaluate Microsimulation Models for Social Welfare Programs. He is currently serving on two additional National Academy of Sciences panels: the Panel on Redesign of the BLS Consumer Expenditure Survey and the Panel on Measuring Medical Care Risk in Conjunction with the New Supplemental Income Poverty Measure. In 2004, he was designated a lifetime national associate of the National Academies. Dr. Betson's research has dealt with the impact of tax and transfer programs on the economy and the distribution of income. A particular research interest is child support policy, on which he has written academic papers and consulted with numerous state governments regarding the development of their child support guidelines. In 2007, he was appointed to the Washington State Commission on the Review of Child Support Guidelines. Dr. Betson has a Ph.D. in economics from the University of Wisconsin at Madison.

MARIANNE P. BITLER is an associate professor of economics at the University of California, Irvine, and a faculty research fellow at the National Bureau of Economic Research, Children's Program and Health Economics Program. She is also a faculty affiliate in demographic and social analysis at the University of California, Irvine; a visiting scholar at the San Francisco Federal Reserve Bank; and a research fellow at the Institute for the Study of Labor in Bonn, Germany. Previously, she was a postdoctoral fellow and then an economist at the RAND Corporation, a research fellow at the Public Policy Institute of California, and an economist on the Board of Governors of the Federal Reserve in the Division of Research and Statistics (where she worked on the Survey of Small Business Finances). Her research interests include labor economics, health economics, public economics, and applied microeconomics. Her publications include several on participation in WIC, which appeared in the *Journal of Human Resources*, the *Journal of Policy Analysis and Management*, the *Review of Agricultural Economics*, and the *Journal of Policy Analysis and Management*. Dr. Bitler holds a Ph.D. in economics from the Massachusetts Institute of Technology.

F. JAY BREIDT is professor and chair in the Department of Statistics at Colorado State University. Previously, he spent nearly 10 years in the Department of Statistics at Iowa State University, starting as an assistant

professor in 1991. While at Iowa State, Dr. Breidt was a member of the
Survey Section, a part of the Statistical Laboratory with a major focus on
design and estimation for large-scale environmental surveys, particularly
the U.S. Department of Agriculture's (USDA's) National Resources Inven-
tory. His research interests include time series, environmental monitoring,
and survey sampling. He is a fellow of the American Statistical Associa-
tion and winner of the 2004 Distinguished Achievement Award from the
American Statistical Association Section on Statistics and the Environ-
ment. At the National Research Council, Dr. Breidt served on several
panels: the Census Bureau's Reengineered Survey of Income and Program
Participation (SIPP); Review of Recreational Fisheries Survey Methods;
and Enhancing the Data Infrastructure in Support of Food and Nutrition
Programs, Research and Decision Making. He prepared two papers for the
workshop sponsored by the Committee on National Statistics' Panel on
Using Data from the American Community Survey (ACS), one of which
explored alternatives to the multiperiod estimation strategy for the ACS.
Dr. Breidt holds M.S. and Ph.D. degrees in statistics from Colorado State.

ROBERT E. FAY is senior statistician at Westat, Inc., in Rockville, Maryland.
He joined Westat in January 2008, after retiring from the U.S. Census
Bureau. He is experienced in multiple aspects of sample surveys, includ-
ing survey design, estimation, variance estimation, imputation and analy-
sis of missing data, statistical modeling of data from complex samples,
and small-area estimation. He is member of the Advisory Committee on
Statistical Methods to Statistics Canada and served on the Federal Com-
mittee on Statistical Methodology, as well as its Subcommittee on Small
Area Estimation. Dr. Fay's recent presentations and papers deal with using
model-assisted estimation to integrate survey and administrative data
in the ACS. He has done considerable research on variance estimation.
He received the Roger Herriot Award for Innovation in Federal Statis-
tics in 2005 and the Gold Medal Award from the Department of Commerce
in 1999. He was a member of the CNN Election Night Decision Team in
2004, 2006, and 2008. Dr. Fay holds a Ph.D. in statistics from the University
of Chicago.

ALBERTA C. FROST is a consultant regarding school nutrition and other
food assistance programs. She was director of the Office of Analysis,
Nutrition and Evaluation at the Food and Nutrition Service of the USDA
until her retirement in 2007. There she directed a staff that conducted
research and developed data analysis systems to evaluate the perfor-
mance and effectiveness of all U.S. food assistance programs and advised
senior policy officials on nutrition policy and long-term planning. During
her career, she directed research on the Food Stamp Program; the Food

Distribution Programs; WIC; and the child nutrition programs, including the National School Lunch and School Breakfast Programs. She has in-depth experience in food assistance policy and management systems, as well as nutrition education and outreach strategies, and has been the recipient of numerous USDA awards. Ms. Frost holds an M.A. in human resources development from American University.

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NANCY J. KIRKENDALL (*Study Director*) is senior program officer for the Committee on National Statistics. Previously, she served as director of the Statistics and Methods Group of the Energy Information Administration (EIA). She spent 3 years as senior mathematical statistician in the Statistical Policy Branch of the Office of Information and Regulatory Affairs of the U.S. Office of Management and Budget. There she served as desk officer for the U.S. Census Bureau and chair of the Federal Commit-

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PENNY E. McCONNELL is director of Food and Nutrition Services for Fairfax County Public Schools. She has been a leader in establishing creative programs to improve nutrition in the nation's eleventh largest school district for the past four decades. She has spoken and written widely on a variety of topics related to feeding and managing a multigenerational, diverse school and community clientele. Ms. McConnell was president of the School Nutrition Association (formerly, the American School Food Service Association) and serves on the Global Child Nutrition Foundation Board and Global Child Nutrition Forum. In this capacity she has attended and spoken at several international meetings. She was president of the Virginia School Nutrition Association, Virginia Dietetic Association and received the Lifetime Achievement Award and Distinguished Dietitian Award respectively. She received the 1999 Silver Plate Award in the elementary and secondary school category and the 2011 Medallion Award, Academy of Nutrition and Dietetics. She is a registered dietitian and chartered School Foodservice and Nutritionist Specialist. Ms. McConnell holds a B.S. in home economics from the University of Manitoba and an M.S. in education from Virginia Polytechnic Institute and State University.

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JOHN PERKINS is a consultant on issues of school nutrition programs and planning. He was formerly the senior director of the Child Nutrition Programs Division in the Texas Education Agency and assistant commissioner for food and nutrition in the Texas Department of Agriculture. As state director, he administered the child nutrition programs in more than 1,100 school districts and 8,000 schools in Texas. His role as state director involved interpreting and implementing federal and state regulations, directing monitoring and compliance reviews of participating school districts, and disbursing more than $1 billion in federal and state funds. Mr. Perkins was the primary architect of the new comprehensive Texas Public School Nutrition Policy. He worked with school administrators, parents, and medical, health, and nutrition groups to develop and implement this policy, which was designed to improve the health of children and the nutrition environment in schools. He was USDA Southwest Region State Director Representative for more than 10 years and a member of the School Nutrition Association Regional Advisory Committee. He has chaired the Food and Nutrition Subcommittee of the Council of Chief State School Officers and served on numerous national and regional com-

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JAMES H. WYCKOFF is Curry Memorial Professor in the Curry School of Education at the University of Virginia. He directs the Center for Education Policy and Workforce Competitiveness at the University of Virginia and is a member of the National Center for Analysis of Longitudinal Data in Education (CALDER) New York team. He is a member of the editorial board of *Education Finance and Policy* and was an American Statistical Association fellow at the U.S. Census Bureau. Dr. Wyckoff's research focuses on education policy and the economics of education. He has published on a variety of topics in education policy, including issues of teacher labor markets, school resource allocation, and school choice. Currently, his research examines policies intended to improve the quality of teaching, especially in schools with large proportions of poor students. At the National Research Council, he was a member of the Committee on National Statistics Panel on Estimates of Poverty for Small Geographic Areas and the Committee on the Study of Teacher Preparation Programs. Dr. Wyckoff holds a Ph.D. in economics from the University of North Carolina at Chapel Hill.

The National School Lunch Program and the School Breakfast Program are key components of the nation's food security safety net, providing free or low-cost meals to millions of schoolchildren each day. For their children to receive free meals, many families have to submit applications that school officials have to review. To reduce this burden on families and schools, the Food and Nutrition Service of the U.S. Department of Agriculture has special provisions that allow all students enrolled in one or more schools in a district to obtain free meals.

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