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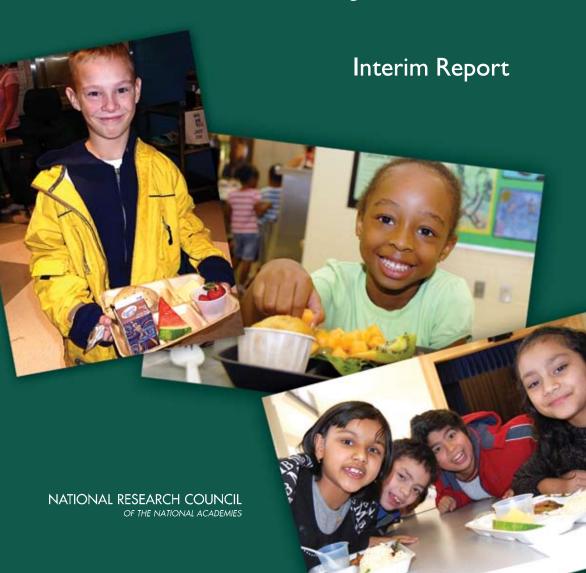
Interim Report

Developing and Evaluating Methods for Using American Community Survey Data to Support the School Meals Programs

Interim Report

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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The Panel on Estimating Children Eligible for School Nutrition Programs Using the American Community Survey wishes to thank the many people and organizations that contributed to the preparation of this interim report. Without their help, the panel could not have completed this planning document within the short time frame provided in the first phase of the project. As chair, I want to thank my fellow panel members for their commitment to the work under a demanding time schedule. They have consistently provided insightful and constructive input under tight deadlines as we developed this report and our plans for the remainder of the study.

The panel thanks John Endahl, Jay Hirschman, and Cindy Long of the Food and Nutrition Service (FNS) for their patient explanation of the many rules, regulations, data sources, and evaluation studies pertaining to the school meals programs. We are also grateful for the expert advice of staff of the U.S. Census Bureau in understanding the data collected in the American Community Survey and the estimates developed in the Small-Area Income and Poverty Estimates Program.

In the preparation of this report, the panel convened two open meetings. At the first one, held on September 1, 2009, informative and helpful presentations on the charge to the panel and on the regulations and operation of the school meals programs were provided by John Endahl, Jay Hirschman, Cindy Long, Melissa Rothstein, and William Wagoner of FNS and Christopher Logan of Abt Associates. Informative and helpful presentations on the American Community Survey, the Small Area Income

and Poverty Estimates Program, and geographical issues were provided by Douglas Geverdt, David Johnson, Donald Lurey, Alfredo Navarro, and Michael Ratcliffe of the U.S. Census Bureau. Stuart Hamilton and Salvatore Saporito of the College of William and Mary gave a helpful presentation about their new School Attendance Boundary Information System.

The second open meeting, held on October 29, 2009, featured presentations on topics concerning measurement of income and program participation in the school meals programs as well as issues related to costs and errors. Special thanks go to Kay Brown, U.S. Government Accountability Office; John Czajka, Mathematica Policy Research; Ed Harper and Gary Vessels, FNS; Constance Newman, Economic Research Service; and Michael Ponza, Mathematica Policy Research.

The panel has been assisted by a very able staff. Our work on this report and our initial study preparations could not have been completed without the many contributions of Nancy Kirkendall, the study director. She provided technical and substantive insights, conducted and oversaw helpful data tabulations, drafted and revised key sections of the report, and kept the panel and project on track. We would like to acknowledge Linda Meyers and Lynn Parker of the Food and Nutrition Board of the Institute of Medicine for their help in identifying individuals knowledgeable about the school meals programs. We are also grateful for the consistently wise counsel provided by Connie Citro, director of the Committee on National Statistics, and for the assistance of Agnes Gaskin, administrative assistant to the committee, in handling the logistical arrangements of the panel and our meetings. Finally, we would like to thank Mary Grider of Mathematica Policy Research for her help with tabulations using the Common Core of Data.

This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the Report Review Committee of the National Research Council (NRC). The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their review of this report: Robert Cromley, Department of Geography, University of Connecticut; David N. Figlio, Institute for Policy Research, Northwestern University; Malay Ghosh, Department of Statistics, University of Florida; Kathy F. Kuser, Consultant, Lithia, FL; Sharon K. Long, Health Policy Center, The Urban Institute, Washington, DC; Joseph Salvo, Population Division, New

York City Department of City Planning; Diane Whitmore Schanzenbach, Harris School of Public Policy, University of Chicago; and Grant I. Thrall, Department of Geography, University of Florida.

Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations nor did they see the final draft of the report before its release. The review of this report was overseen by V. Joseph Hotz, Department of Economics, Duke University. Appointed by the NRC's Report Review Committee, he was responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring panel and the institution.

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 committee work that is the basis of this report would not have been possible.

> Allen L. Schirm, *Chair*
> Panel on Estimating Children Eligible for
> School Nutrition Programs Using the
> American Community Survey

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Executive Summary

The National School Lunch Program and the School Breakfast Program, administered by the Food and Nutrition Service 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 school-age children each day. The annual determination of students' eligibility for free or reduced-price meals requires families to complete and submit applications that are distributed and reviewed by school officials. To reduce the substantial burden on families and schools and expand access to school meals, USDA regulations allow school districts to operate their school meals programs under special provisions that eliminate the application process and some other administrative activities in exchange for providing free meals to *all* students enrolled in one or more schools in a district.

Under the most commonly adopted provisions, USDA reimburses districts for meals served on the basis of data collected in a "base year," during which applications are taken. After 3 or 4 years, applications must be taken again to establish new base-year data, unless the district provides evidence that local conditions have not changed.

While providing universal free meals, a school district must use nonfederal funds to make up any difference between its costs and the reimbursement from USDA. Therefore, the special provisions are most attractive for schools with high percentages of students eligible for free or reduced-price meals. The need to reestablish a base year, however, presents challenges. After several years without taking applications, schools can

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lose institutional knowledge and encounter difficulties in processing applications, and families are no longer accustomed to completing them.

A special provision that does not require applications to be taken every few years would further reduce burden, be more attractive to school districts, and potentially increase student participation by expanding access to free meals. To support the development of such a provision, the Food and Nutrition Service asked the National Academies' Committee on National Statistics and Food and Nutrition Board to convene a panel of experts to study the technical and operational issues that arise in using data from the American Community Survey (ACS)—a new continuous survey replacing the long-form survey of the decennial census—to obtain estimates of students who are eligible for free and reduced-price meals for schools and school districts. Such estimates would be used to develop "claiming percentages" that, if sufficiently accurate, would determine federal reimbursements to districts for the schools that provide free meals to all students under a new special provision that eliminates the base-year requirements of current provisions.

The panel is conducting the study in three phases and will issue three reports. This first report, released at the end of the panel's first year, presents in detail our technical approach to conducting the study. A final report, to be released at the end of the second year, will present findings from empirical analyses, including results from case studies of five or six school districts, and the panel's recommendations for estimation methods and processes. Because the Census Bureau is not scheduled to release the first set of 5-year period estimates from the ACS until December 2010, those estimates will not be available in time for us to use in the analyses in our final report. The panel will therefore publish an addendum to the final report about 9 months after the release of the 5-year ACS estimates.

To develop methods for deriving eligibility estimates for the school meals programs, the panel will assess which combination of ACS variables most closely reflects the eligibility criteria of the programs, working with the Census Bureau to obtain ACS estimates for school districts. School district boundaries are maintained in the bureau's geographic database (Topologically Integrated Geographic Encoding and Referencing, TIGER) and are updated every 2 years.

It is likely that some adjustments and other improvements of ACS estimates will be needed, and the panel will evaluate these improvements. For example, an adjustment might be needed to improve the estimation of program eligibility, which is determined by monthly income, from the annual income data collected in the ACS. To improve the precision of ACS estimates, which are likely to have large sampling errors for individual schools and even many school districts, the panel will investigate the use of small-domain estimation methods based on extensions of the methods

used in the Census Bureau's Small Area Income and Poverty Estimates (SAIPE) Program. The panel will also determine how to use the ACS-based eligibility estimates and other data to derive claiming percentages for reimbursement that reflect the patterns of student participation and the meals that would be served under a new provision with universal free meals.

Although the Census Bureau is producing ACS and SAIPE estimates for school districts, it does not maintain geographic information or produce estimates for school attendance areas. To address the challenges that arise in obtaining estimates for individual schools or groups of schools, the panel will conduct case studies of five or six school districts. These districts will provide digitized attendance-area boundaries and detailed information on program operations for their schools. The panel will evaluate the accuracy of the boundaries and develop estimation methods that can be applied to a single school district that is considering whether to adopt a new special provision in only some of its schools.

The panel will evaluate the quality of estimates for school districts and schools in terms of sampling error, model bias, timeliness, and other properties that affect their fitness for use in determining reimbursements to school districts. This evaluation will compare potential errors under a new special provision with errors under current procedures for operating the school meals programs. Using data from the case studies, the panel will describe the conditions that would render a new special provision more or less attractive to school districts. Finally, the panel will consider the operational feasibility of estimation methods and identify the administrative agreements and procedures needed to ensure that the recommended methods can be implemented in practice.

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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 seek to provide nutritionally balanced, low-cost or free lunches and breakfasts to students each school day. They are a key component of the nation's food security safety net, serving millions of children who might otherwise not obtain adequate nutrition.

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, both programs are usually administered by state education agencies, which operate the programs through agreements with local education agencies (LEAs), commonly known as school districts.[1]

Determination 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]"Prior to 2004, the term school food authority (SFA) was used for local agencies administering the school meals programs. In 2004, the Child Nutrition and WIC Reauthorization Act added the term local education agency (LEA) to identify the entity responsible for application, certification, and verification activities for the NSLP and SBP. . . . LEA is used when discussing application, certification, and verification activities. The term . . . SFA is used when discussing other activities." (*Eligibility Manual for School Meals: Federal Policy for Determining and Verifying Eligibility*, see http://www.fns.usda.gov/cnd/Governance/notices/iegs/EligibilityManual.pdf [accessed June 2010]). Because the vast majority of participating schools are part of school districts, we use the term school district throughout this report to refer to both public and private nonprofit local entities that enter into agreements with state agencies to operate the SBP and the NSLP.

administrative burden for schools and families. To ease the administrative burden and at the same time expand the reach of the meals programs, USDA regulations currently allow school districts to use alternative provisions for determining federal reimbursement for meals served in one or more schools in a district. Under two such alternative provisions, the district provides free meals to *all* students in the participating schools (supplementing federal funds with local funds) and, in exchange, takes applications from students' families and conducts some other administrative activities at most once every 4 years.

With the 2005 inception by the U.S. Census Bureau of a major new continuous survey, the American Community Survey (ACS), which collects income and other relevant information on very large samples of families every month, FNS decided to investigate the feasibility of using data from the ACS or other sources in the administration of the school meals programs. FNS asked the National Academies' Committee on National Statistics and Food and Nutrition Board to convene an expert panel to consider ways in which the burden could be further reduced for school districts that provide free meals to all students in participating schools by using available data to estimate the share of meal costs to be reimbursed by the federal government. This, the panel's interim report, specifies the technical approach and work plan that the panel will follow in responding to its charge.

OVERVIEW OF SCHOOL MEALS PROGRAMS

USDA has provided assistance to elementary and secondary schools for meals served to students for over 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 over 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 reimbursements for snacks served to students in after-school educational and enrichment programs.

Currently, the NSLP operates in over 101,000 public and nonprofit private schools and residential child care institutions. In fiscal year (FY) 2009, the program subsidized lunches to more than 31 million students each school day at an annual cost to the federal government of $9.8 billion. The SBP currently operates in more than 88,000 schools and institutions; in FY 2009, the program subsidized breakfasts to 11 million students each school day at an annual cost to the federal government of $2.6 billion.[2]

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[2]Data for FY 2009 were provided to the panel by FNS.

School lunches and breakfasts must meet the applicable recommendations of the 1995 Dietary Guidelines for Americans, which recommend that no more than 30 percent of an individual's calories come from fat and less than 10 percent come from saturated fat. Regulations also establish a standard for school lunches and school breakfasts to provide one-third and one-fourth, respectively, of the recommended dietary reference intakes (formerly allowances) of protein, vitamin A, vitamin C, iron, calcium, and calories. Traditionally, schools used food-based menu planning, which required school meals to offer set numbers of servings from specific food groups, with minimum portion sizes that varied by age. For example, NSLP lunches were required to offer one serving of meat or meat alternatives (cheese, beans), at least one serving of grains or bread, two servings of different fruits and/or vegetables, and one serving of fluid milk. There is an alternative nutrient-based standard for school meals that allows schools greater flexibility in the types of foods offered, but it requires nutrient analysis of planned menus. An enhanced food-based system that calls for larger fruit and vegetable portions and more grains and breads is also available. School meals must meet federal nutrition requirements, but decisions about what specific foods to serve are made by local school food authorities.[3]

Any child at a participating school may purchase a meal through the NSLP or the SBP. Students from families with incomes at or below 130 percent of the U.S. Department of Health and Human Services 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 cents for lunch and no more than 30 cents for breakfast. Students from families with incomes over 185 percent of the poverty guideline pay a 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 the SBP comes in the form of a cash reimbursement for each meal served. As a result, schools must count and

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[3]FNS has sought advice from the Institute of Medicine to update the school meals requirements consistent with the 2005 Dietary Guidelines for Americans—see Institute of Medicine (2007, 2008, 2009).

[4]The 2009 poverty guidelines were issued January 23, 2009, and have been extended for use in applicable federal assistance programs through at least March 1, 2010. The 2009 poverty guideline in the 48 states and the District of Columbia for a family of four is $22,050; 130 percent is $28,665; 185 percent is $40,793. Poverty guidelines vary by family size and are higher for Alaska and Hawaii, see http://aspe.hhs.gov/POVERTY/09extension.shtml [accessed May 2010].

report the number of qualified meals by eligibility category (free, reduced price, or full price).

To determine students' eligibility for free or reduced-price meals each year, school districts must publicize the availability of free or reduced-price meals and interested families submit applications. 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 agency, are required to work with other agencies to identify students who can be "directly certified"; that is, automatically eligible for free school meals because their families are enrolled in another income-assistance program, such as 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).[5]

For many years, federal, state, and local officials have been concerned about the burden of eligibility determination, verification, and meal counting, not only in terms of the time and resources required, but also because it may 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 sort out each child's eligibility status. Another issue has to do with the potential perceived stigma associated with participating in the program. While overt identification of students participating in the program is prohibited, an FNS study (U.S. Department of Agriculture, Food and Nutrition Service, 1994a) suggested that perceived stigma is a major factor in nonparticipation. It observed that perceived stigma is generally more of an issue with high school students than with elementary school students, with middle school students in a transition stage.

To reduce costs and expand participation, federal regulations issued in 1980 permitted individual schools to use one of two special provisions designed to reduce paperwork and administrative burden in the school meals program; in 1995, a third special provision was added. Provision 2 and Provision 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.[6] Then for the duration of use of one of the

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[5]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.

[6]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.

provisions, 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.[7] In 2004, the Child Nutrition and WIC Reauthorization Act (Public Law 108-265) expanded the opportunity to use Provision 2 or Provision 3 to groups of schools or entire school districts.

While many school districts have adopted Provision 2 and fewer have adopted Provision 3,[8] operation under the provisions can be challenging. Under these provisions, "claiming percentages" for reimbursement are established in a "base year," during which schools take applications and conduct direct certification and count the number of meals served by category. During the following 3 or 4 years, schools offer meals at no cost to all students, count the total number of meals served, and are reimbursed based on the meal counts by category during the base year. At the end of 4 years, when it is time to establish a new base year, many schools have lost some of the institutional knowledge and procedures needed to process applications, and families are no longer accustomed to completing the application forms.

FNS would like to develop new methods for reducing paperwork and administrative burden on schools and families and make it easier for more low-income students to participate in the school meals programs. One possible approach is to develop estimates of students who are eligible for free and reduced-price meals from income data collected in the ACS and use these estimates as the basis for reimbursement under a provision similar to Provision 2 or Provision 3. For the purposes of this report, we refer to an approach that uses ACS-derived estimates as the basis for reimbursement as Provision 4. If such 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 once every few years, and more schools might choose to provide free meals to all of their students.

PANEL CHARGE AND APPROACH

In response to a request from the USDA Food and Nutrition Service, a panel of experts, convened by the Committee on National Statistics, is studying technical and operational issues in using the ACS to provide small-area estimates of students who are eligible for free and reduced-

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[7]More detailed information about these provisions is provided in Chapter 2 and Chapter 6.

[8]According to U.S. Department of Agriculture, Food and Nutrition Service (2007a:vol. 1, p. 47), 12.9 percent of schools used Provision 2 and 1.3 percent used Provision 3 in a nationally representative survey conducted during school year 2004-2005.

price school lunches and breakfasts. The purpose of the estimates is to provide "claiming" percentages by which USDA would reimburse school districts for providing free meals to all students attending specified schools. From the panel charge:

> The panel will consider the ability of the ACS to provide estimates for school attendance areas, built by aggregating sampled values for census 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 (SAIPE) Program 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 will conduct its work in three phases and issue three reports during a 36-month study: (1) a report at the end of year 1 that outlines methods for developing estimates; (2) a report at the end of year 2 that includes simulated estimates for five to six large school districts and recommendations for estimation methods and processes; and (3) a report completed within 9 months of the release of ACS 5-year estimates (scheduled for December 2010) that implements the panel's recommended approach with actual ACS data in selected school districts. The Committee on National Statistics will obtain input as needed during the project from the Institute of Medicine's Food and Nutrition Board.

ORGANIZATION OF THE REPORT

Following this introduction, Chapter 2 provides background on the administration of the school meals programs. Chapter 3 describes current data sources, including the ACS and SAIPE, that may provide useful estimates of eligibility for free and reduced-price school meals to be used in a new Provision 4 for administering the programs. Chapter 4 provides a framework for examining school districts and introduces the selection of districts to serve as case studies. Chapter 5 describes methods the panel will consider for developing estimates of claiming percentages for free and reduced-price meals and adjusting those estimates so that they will better reflect the eligibility requirements of the school meals programs and improve their reliability for small school districts and school attendance areas. Chapter 5 also addresses issues in estimating school meals participation, particularly changes in participation that may be due to providing lunch or breakfast at no cost to all students, and in assessing the potential costs of the programs to school districts under a new Provision 4. The panel has chosen to be comprehensive in its description of methods to be

considered. As work progresses, we will focus on those methods with the greatest potential of responding to our charge within the time frame of our study. Chapter 6 discusses how alternative estimates will be assessed concerning their fitness for use. Chapter 7 addresses issues of operational feasibility. The report makes no recommendations or conclusions; its purpose is to present a well-specified approach to carrying out the charge.

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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). It is essential to understand all elements of the school meals programs to be able to consider alternative procedures that could reduce administrative burden and make it possible to provide nutritious meals to a greater number of the nation's school-age children.

CONCEPTUAL FRAMEWORK

Figure 2-1 illustrates the flow of the process from determining the eligibility of students to serving them nutritionally qualified meals, noting that there are different distributions of students and meals served across the free, reduced-price, and full-price meal categories at each point. 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[1] and have ignored how the distributions and the relationships among them change over time.

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[1]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), even if the family's income rises above the eligibility threshold for free meals.

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FIGURE 2-1 School meals process and distributions of enrolled students and meals served across free, reduced-, and full-price categories: traditional approach and universal free meals.

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 program rules, and all other students, who are eligible 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.[2] Students

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[2]The certification process encompasses both direct certification and the solicitation, submission, and review of applications.

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 (or the verification process). All students who either do not apply or are not directly certified for free meals are eligible 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. These students 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 in the figure (third item), 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.

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 child 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 in the figure (fourth item), "M_O: Meals Served—Observed Under Traditional Approach," represents the distribution of meals served (across the free, reduced-, 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 in terms of food group composition, serving size, etc. The cashier also determines whether the child 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.[3] 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 in the figure (fifth item), "M_U: Meals Served—Universal Free Meals (Unobserved)," represents the participation distribution when meals are provided for free to all students. The distribution is unobserved because meals are not counted by category when they are provided for free under a special operating provision, such as Provisions 2, 3, or 4. The available evidence suggests that if meals were provided at no cost, more students would participate. This distribution is important in assessing the costs and benefits of a new provision, and the ultimate objective of the panel is 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.

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."[4] Students are "categorically eligible" for free meals if someone in the family participates in certain other means-tested public assistance programs targeted for 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 is also categorically eligible if he/she is enrolled in a Head Start or Even Start Program, 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

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[3]The Richard B. Russell National School Lunch Act (Section 9B(10), pp. 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, see http://www.fns.usda.gov/cnd/Governance/Legislation/NSLA-10-2008.pdf [accessed May 2010].

[4]See *Eligibility Manual for School Meals: Federal Policy for Determining and Verifying Eligibility,* see http://www.fns.usda.gov/cnd/Governance/notices/iegs/EligibilityManual.pdf [accessed June 2010].

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.

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 for full-price meals.[5]

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, usually through their state agency, directly certify "categorically eligible" students based primarily on their participation in SNAP, TANF, and 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, etc.) 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 students are eligible and do not need to file an application. Matching for direct certification is done at least once a year. Some states conduct direct certification more frequently to identify newly eligible students. For example, Washington State conducts direct certification monthly. As discussed below, certification for free meals remains effective for the rest of the school year and for up to 30 days into the next school year. Through direct certification, an estimated 71 percent of students from SNAP-participant households nationwide were certified for free school meals in SY 2008-2009 without applications.[6] Due to errors in record matching or participation in a program for which a state does not perform direct certification, 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.

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[5]See *Eligibility Manual for School Meals: Federal Policy for Determining and Verifying Eligibility*, see http://www.fns.usda.gov/cnd/Governance/notices/iegs/EligibilityManual.pdf [accessed June 2010].

[6]In some states, direct certification rates were nearly 100 percent (U.S. Department of Agriculture, Food and Nutrition Service, 2009).

Just prior to and at the beginning of a school year (normally mid-July through early September), 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. 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 about whether the child should be approved for free or reduced-price meals. If an application lists a legitimate case number for SNAP or other approved program, the student is 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 for the entire school year and up to 30 operating days into the subsequent school year. A family may submit an application at any time during the year and may do so later in the year if, for example, its income changes or it starts participating in SNAP or TANF.

The distribution of approved students by category for the school meals programs in fiscal year (FY) 2005-2009 is shown in Table 2-1. This is the C_O distribution in Figure 2-1.

Not all families with students who are eligible for free or reduced-priced meals submit applications. 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). Although this may no longer be true in light of incentives (such as the allocation of funds in other programs) and processes (such as direct certification) for certifying as many eligible students as possible for free meals, more recent estimates are not available.

TABLE 2-1 Percentage of Enrolled Students by Approval Status for School Meals Programs, FY 2005-2009

Fiscal Year	Approved for Free Meals	Approved for Reduced-Price Meals	Must Pay Full Price for Meals
2009	40.2	8.7	51.1
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 school meals programs includes both the National School Lunch Program and the School Breakfast Program.
SOURCE: Tabulation from the Food and Nutrition Service National Data Bank provided to the panel, February 4, 2010.

TABLE 2-2 Number of Students Eligible for NSLP from Two Sources: (1) CPS Estimates Based on Annual Income and (2) NSLP Certifications for Free and Reduced-Price Meals (in thousands), 1993-1999

	Free Lunch			Free and Reduced-Price Lunch		
Year	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).

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 (Figure 2-1), with eligibility based on annual income data. These estimates were compared with the numbers of students approved as being 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 as being income eligible for free meals, and the number of students approved for free or reduced-price meals was 102 percent of the number of students who were estimated as being income eligible for free or reduced-price meals. These results were interpreted as evidence that there was over-certification in the school meals programs and contributed to the passage of 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).[7] Subsequent research found that at

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[7]As discussed in Chapters 3 and 5 of the 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.

least some of the difference between estimated income eligibility from the CPS and approval status under the school meals programs may 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 the SBP (U.S. Department of Agriculture, Food and Nutrition Service, 2007b). Erroneous payments may arise because of certification errors due to household reporting, administrative mistakes, or non-certification 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 SY 2005-2006. 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. It also found that over-certification 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 in Chapter 6.

VERIFICATION

In addition to special studies, such as the APEC study, school districts are required to annually verify a sample of NSLP and SBP applications. 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.[8] Verification is to be completed by November 15 of the current school year. Samples are to be selected from "error prone" applications, which are those with reported monthly income 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

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

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 do not respond. The students in households that fail to provide the required documentation are removed from eligibility. Results of the outcomes of verification studies are reported annually on Form FNS-742. Data for each school district are reported via state agencies to FNS regional offices, which upload the data to FNS headquarters, where they are maintained.

PARTICIPATION

Any child attending a school that participates in the school meals programs may obtain a meal. Cashiers assess which meals meet the nutritional requirements of the NSLP and the 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 are aggregated to the school, to the school district, and to the state. This process provides the meal counts maintained in school records, which are also reported to FNS via Form FNS-10.

FNS defines participation as the 9-month (September-May) average of each month's average daily meals served, divided by an attendance factor of .927 to account for school absenteeism.[9] Table 2-3, from a special tabulation from the FNS National Data Bank, shows participation (average daily number of meals served divided by .927) 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.

Another way of looking at participation is by meal category (see Table 2-4). Dividing participation (average daily number of meals served by category divided by .927) in a month by the total number of enrolled students approved in that category shows consistently higher participation by students approved for free meals, followed by students approved for reduced-price meals, followed by students having to pay full price.

While the participation rates in Table 2-4 are based on meals served divided by .927 (in the numerator), similar national rates are obtained when participation is measured by the number of approved students who take meals. As discussed in the FNS report *School Lunch Eligible Non-Participants* (U.S. Department of Agriculture, Food and Nutrition Service, 1994a:I-5):

> [S]ome children who are approved to receive free or reduced-price meals do not always obtain the meals. Previous studies have shown that stu-

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[9]See http://www.fns.usda.gov/pd/cnpmain.htm [accessed May 2010].

TABLE 2-3 Official NSLP Participation (average daily meals divided by .927) and Percentage of Lunches Served by Approval Category, FY 2005-2009

Fiscal Year	NSLP Participation	Percentage of Lunches Served		
		Free	Reduced Price	Full Price
2009	31,227,700	52.0	10.1	37.9
2008	31,015,182	49.6	10.1	40.3
2007	30,513,236	48.9	10.0	41.2
2006	30,132,869	49.0	9.8	41.2
2005	29,646,189	49.2	9.7	41.1

SOURCE: Tabulation from the Food and Nutrition Service National Data Bank provided to the panel, February 4, 2010.

TABLE 2-4 NSLP Participation (average daily meals divided by 0.927) by Approval Category, FY 2005-2009

Fiscal Year	Participation Rate (Percentage)		
	Free	Reduced Price	Full Price
2009	80.0	72.1	46.0
2008	80.7	72.2	46.4
2007	80.5	73.3	46.1
2006	78.5	70.8	46.3
2005	79.1	71.5	44.9

SOURCE: Tabulation from the Food and Nutrition Service National Data Bank provided to the panel, February 4, 2010.

dent participation rates (the percentage of students in a given group who take or purchase a meal on a typical day) are about 80 percent for students approved for free meals, about 70 percent for students approved for reduced-price meals, and about 45 percent for students who pay full price. Participation rates decline considerably as students get older.

More recent information on participation is available from the School Nutrition Dietary Assessment Study-III (U.S. Department of Agriculture, Food and Nutrition Service, 2007a). The main focus of the study was to look at the nutritional content of school meals and to identify student and parent reasons for participation or nonparticipation. This study used the following two definitions of participation: (1) percentage of enrolled students who took a meal that qualified under the school meals program on a target day, and (2) the percentage who "usually" took such a meal, with "usually" defined as 3 or more days per week.

On a typical day in SY 2004-2005, about 62 percent of all students participated in the NSLP and about 18 percent participated in the SBP. Nearly three-quarters of students reported participating in the NSLP 3 or more days per week, and one-quarter reported participating in the SBP 3 or more days per week. Parents of students who did not participate in the NSLP reported some of the same reasons as students did for this decision—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 shows participation rates according to the first definition separately 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 poverty (that is, students income eligible for either a free or a reduced-price meal) participated in the school lunch program on the target day, and 62 percent of all elementary school students with family income more than 185 percent of poverty participated in the school lunch program. For middle school students, participation rates were lower than for elementary school students in all three income categories; participation by those eligible for a reduced-price meal fell in between participation for 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, except that the participation rate of high school students eligible for a reduced-price meal was no lower than the corresponding middle school participation rate

TABLE 2-5 Target Day Participation Rates in the 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:vol. II, p. 36).

and higher than the participation rate of high school students eligible for a free meal.

The main objective of our panel is 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 American Community Survey (ACS), to establish claiming percentages for reimbursement from the U.S. Department of Agriculture (USDA). A student who was approved for a reduced-price meal would save 40 cents per meal with universal free meals, and a student who would otherwise pay for a meal would save the entire amount that was charged by the school district. Consequently, one might expect the rate of increased participation from providing free meals to all students to be greatest for students who formerly had to pay for their meals, followed by reduced-price-eligible students, followed by students already eligible for free meals.

COUNTING, CLAIMING, AND REIMBURSEMENT

The meal counting process begins when the cashier determines whether a child's meal qualifies as a reimbursable meal (by satisfying the nutritional requirements described in Chapter 1)[10] and whether the child 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's line, regardless of eligibility status. According to the APEC report (U.S. Department of Agriculture, Food and Nutrition Service, 2007b:vol. I, p. 16):

> [T]o 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 full price (except for schools using Provision 2 or 3 in nonbase 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.

The state reports monthly aggregates to FNS on Form FNS-10. These data are used by FNS to determine reimbursements due to the states. The states distribute the reimbursement to the school districts.

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[10]That is if the meal satisfies the nutritional requirements described in Chapter 1.

TABLE 2-6 Federal Reimbursement Rates for 2009-2010 School Meals Programs by Eligibility Category

Eligibility Category	Lunch Rate	Breakfast Rate
Free (income at or below 130% of poverty guideline)	$2.68 ($2.70)	$1.46 ($1.74)
Reduced Price (income 130 to 185% of poverty guideline)	$2.28 ($2.30)	$1.16 ($1.44)
Full Price (income greater than 185% of poverty guideline)	$0.25 ($0.27)	$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/nsl09-10t.pdf [accessed June 0210].

Most of the support USDA provides to schools in the NSLP and the SBP comes in the form of a monthly cash reimbursement for each meal served. Table 2-6 shows reimbursement rates by eligibility category for SY 2009-2010. (Rates may be adjusted at the beginning of each school year.) Schools that served more than 60 percent free and reduced-price lunches 2 years earlier are eligible for 2 cents 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 are also in effect for Alaska and Hawaii.

SPECIAL PROVISIONS FOR OPERATING THE SCHOOL MEALS PROGRAMS

For determining claiming percentages for reimbursement from USDA for free, reduced-, and full-price meals, schools, groups of schools, or entire school districts may choose to participate in one of three special provisions 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 approved in federal regulations in 1980. Provision 3 was approved in regulations in 1995.

Provisions 1, 2, and 3

Provision 1 permits schools enrolling at least 80 percent of students who are eligible for free or reduced-price meals to certify students' eligi-

bility for free meals for 2 years instead of reestablishing eligibility every year. There are currently very few schools operating under Provision 1.

Provision 2 permits schools, groups of schools, and entire school districts to establish claiming percentages for federal reimbursement via 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 makes eligibility determinations, conducts verifications, and takes meal counts by type (but does not charge for any meals). During the next 3 years, the school makes no new eligibility determinations or verification checks and counts only the total number of reimbursable meals served each day.[11] Reimbursement during these years is determined by applying the percentages of free, reduced-, and full-price meals served during the corresponding month of the base year to the total count of reimbursable meals for the claiming month. The base year is included as part of the 4 years. At the end of each 4-year period, the state agency may approve a 4-year extension if the income level of the school's population remains stable.[12] 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. 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. For each of the 4 years, the level of federal cash and commodity support is adjusted only to reflect changes in enrollment, the number of operating days, and inflation. Unlike 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 state agency may approve a 4-year extension if the income level of the school's population remains stable.

Provision 1 offers the least reduction in paperwork and administrative burden of the three provisions. Provisions 2 and 3 offer greater reductions in paperwork and administrative burden; in return, schools electing to use one of these two provisions must pay the difference between fed-

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

[12]The income level of a school is defined as stable if it does not improve by more than 5 percent, after adjusting for inflation, between the base year and the comparison year, and income is measured by the source of socioeconomic data used on the approved application for provision status to the state.

eral reimbursement and the cost of providing all meals at no charge from sources other than federal funds. According to the Food Research and Action Center, "Schools that have implemented Provision 2 or 3 have found that they can offset cost differentials with as few as 60 to 75 percent of students eligible for free- or reduced-price school meals."[13] According to the SNDA Study-III, 12.9 percent of schools used Provision 2 and 1.3 percent of schools used Provision 3 to provide free meals to all students in SY 2004-2005 (U.S. Department of Agriculture, Food and Nutrition Service, 2007b).

Philadelphia Pilot Project

FNS uses pilot projects to test alternative procedures in the school meals programs. One pilot project in the School District of Philadelphia is ongoing and is relevant to the panel's work. This district has a hybrid system with one-third of schools operating under the traditional procedures and two-thirds of schools providing free meals to all students and developing claiming percentages by combining information about students in households that were 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 no-fee schools. The steps in the process for estimating claiming percentages included direct certification, followed by a survey of nondirectly certified students. The direct certification and household survey data showed that 79.6 percent of the students attending the no-fee public schools were eligible for free or reduced-price meals.

In the early 2000s, FNS commissioned the U.S. Census Bureau to conduct a study to develop eligibility estimates for schools in the School District of Philadelphia from the 2000 Census long-form sample (Geverdt, 2005), which the ACS replaces. Developing appropriate digitized school attendance boundaries was the most challenging part of obtaining estimates for school attendance areas and was undertaken in collaboration with officials in Philadelphia. 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). The study found that, on average, the census estimated that 61 percent of students were eligible for free or reduced-price meals compared with 74 percent approved according to the CCD. Some of this difference is likely to be due to the difference between

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[13]See http://www.frac.org/html/federal_food_programs/cnreauthor/provision2.htm [accessed May 2010].

eligibility as measured by annual income in the census and eligibility as measured by monthly income in the school meals programs.

Alternative Reimbursement Formulas

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 as eligible for free, reduced-, or full-price meals multiplied by the applicable meal reimbursement rates. Thus, federal government outlays (G) for reimbursable meals under the NSLP or the SBP are

$$G_t = R^f M^f_t + R^r M^r_t + R^p M^p_t$$

where
- G_t is the government 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., $2.68 for the NSLP in SY 2009-2010, 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^f_t is the total number of free meals served in month t;
- M^r_t is the total number of reduced-price meals served in month t;
- M^p_t is the total number of full-price meals served in month t; and
- $M_t = M^f_t + M^r_t + M^p_t$ is the total number of reimbursable meals served in month t.

Under Provision 2, the number of meals served by category, M^f_t, M^r_t, and M^p_t, in the school, group of schools, or school district 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

$$G^2_t = R^f \frac{M^f_{0,t}}{M_{0,t}} M_t + R^r \frac{M^r_{0,t}}{M_{0,t}} M_t + R^p \frac{M^p_{0,t}}{M_{0,t}} M_t$$

where
- G^2_t is the government 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;
- $M^f_{0,t}$ 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; and
- $M_{0,t} = M^f_{0,t} + M^r_{0,t} + M^p_{0,t}$ is the total number of reimbursable meals served during month t of the base year.

The ratios in the equation above are the Provision 2 claiming percentages.

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 inflation since the base year. Therefore, the reimbursement formula for Provision 3 is

$$G^3_t = R^f \, \delta M^f_{0,t} + R^r \, \delta M^r_{0,t} + R^p \, \delta M^p_{0,t}$$

where
- G^3_t is the government 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; and
- δ is a ratio adjustment factor (ratio of current value to base year value) reflecting changes in enrollment and inflation.

Philadelphia uses an enrollment-based method in conjunction with the traditional approach. About one-third of the schools (low poverty) operate under traditional procedures and about two-thirds of the schools (high poverty) provide free meals to all students and use claiming percentages based on data from a socioeconomic survey combined with the number of directly certified students to estimate the percentage of

enrolled students eligible for free, reduced-price, and full-price meals. The overall reimbursement formula is

$$G_t^{Philadelphia} = G_t^{Traditional} + G_t^{survey}$$

where

- $G_t^{Traditional}$ is the federal government outlay for one-third of the schools using the traditional application and meal counting and claiming procedures; and
- G_t^{survey} is the federal government outlay established for two-thirds of the schools operating no-fee programs as described below:

$$G^{survey}_t = R^f \frac{E^f}{E} M_t + R^r \frac{E^r}{E} M_t + R^p \frac{E^p}{E} M_t$$

where

- 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 from 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; and
- $E^p = E - E^f - E^r$ is the number of enrolled students who are eligible for full-price meals.

If sufficiently accurate estimates of eligibility can be derived from the ACS and other data, the following formula, similar to the formula used for the two-thirds of Philadelphia schools operating no-fee programs, was described to the panel by FNS as one that the agency would consider using to determine reimbursement for a school, group of schools, or an entire district that provides universal free meals under a new special provision, which we term Provision 4:

$$G_{e\,t}^4 = R^f \frac{E^f}{E} M_t + R^r \frac{E^r}{E} M_t + R^p \frac{E^p}{E} M_t$$

where

- $G_{e\,t}^4$ is the government outlay for reimbursable meals served in month t in Provision 4 schools, based on eligibility estimates, 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 in month t;
- E^f is the estimated number of enrolled students who are eligible for free meals based on the ACS and other sources;
- E^r is the estimated number of enrolled students who are eligible for reduced-price meals based on the ACS and other sources;
- E is the estimated number of enrolled students in Provision 4 schools based on the ACS and other sources; and
- $E^p = E - E^f - E^r$ is the estimated number of enrolled students who are eligible for full-price meals.

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 substantial concern with the previous "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 first meeting of the panel,[14] 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 will focus on a more general expression for the Provision 4 reimbursement formula:[15]

$$G_{p\,t}^{\,4} = R^f C^f M_t + R^r C^r M_t + R^p C^p M_t$$

where

- $G_{p\,t}^{\,4}$ is the government outlay for reimbursable meals served in month t in Provision 4 schools, based on eligibility and participation estimates, 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 in month t;
- C^f is the claiming percentage for free meals, an estimate for the fraction of reimbursable meals served to students eligible for free meals;

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[14]FNS gave a hypothetical example of a school with 70 percent of the students eligible for free meals, 10 percent eligible for reduced-price meals, and 20 percent eligible for full-price meals. But 77.7 percent of meals were served to students eligible for free meals, 10 percent of meals were served to students eligible for reduced-price meals, and 12.3 percent of meals were served 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 2 cents per meal increment.)

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

- C^r is the claiming percentage for reduced-price meals, an estimate for the fraction of reimbursable meals served to students eligible for reduced-price meals; and
- $C^p = 1 - C^f - C^r$ is the claiming percentage for full-price meals.

The claiming percentage[16] for a category is the estimated fraction of reimbursable meals that will be served to students who are eligible for that category (however, meals will be provided free to all students). The three claiming percentages are the M_U distribution in Figure 2-1, and, as noted above, the ultimate objective of this panel is to determine whether there is a reliable and operationally feasible method for estimating this distribution.

Having worked through the complex procedures and sets of steps for administering the NSLP and SBP programs under traditional and special provisions for reimbursement, one can see the potential advantages of an approach using existing data that could further reduce the burden on parents and schools and at the same time enable the school meals programs to serve additional students. The remaining chapters describe our technical approach for developing and evaluating methods for estimating the claiming percentages in the Provision 4 reimbursement equation. The next chapter discusses the ACS and other sources of data relevant to our study.

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[16]Although the claiming percentages are called "percentages," they would be expressed as proportions for the purposes of calculating reimbursements using the formula.

3

The American Community Survey
and Other Data Sources

The American Community Survey (ACS) is the only survey that might be large enough to estimate numbers of students eligible for free or reduced-price meals in school attendance areas to use in a new Provision 4 for establishing claiming percentages for reimbursement of school meal costs by the U.S. Department of Agriculture (USDA). The panel will consider estimates from the ACS in light of accuracy, timeliness, and geographical coverage. Assessment of these properties, and possible corrections of shortcomings, requires additional data sources or data products. This chapter begins with a description of the ACS and follows with descriptions of the other data sources that will be used in the study. Table 3-1 lists each data source or product and notes the primary issue that each will be used to address.

The chapter describes the administrative data collected by the Food and Nutrition Service (FNS) in support of the school meals programs, as well as information about schools provided by the National Center for Education Statistics (NCES). These data sources will be used for deriving and evaluating any estimates obtained using methods proposed by this panel that could potentially support a new Provision 4. The primary use of the FNS and NCES administrative data will be to assess bias in estimates based on the ACS.

One of the known reasons for potential bias in ACS-based estimates is that ACS measures annual income, whereas eligibility for school meals programs is based on monthly data. The Survey of Income and Program Participation (SIPP) is the source of information that could be used to adjust for any such bias. Hence this chapter describes SIPP.

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TABLE 3-1 Data Sources or Product to Be Used and Which Issue Each Will Be Used to Address

Data Sources and Estimation Programs	Establishing Geographic Boundaries of School Districts	Establishing Geographic Boundaries of Schools	Estimating Eligible Students	Evaluating and Correcting for Bias or Lack of Timeliness	Modeling to Improve Precision	Estimating Participation	Estimating Costs
American Community Survey (ACS)			X		X		
School Meals Administrative Data				X	X	X	X
Common Core of Data (CCD)				X	X		
Survey of Income and Program Participation (SIPP)				X			
Small Area Income and Poverty Estimates (SAIPE) Program					X		
TIGER/School District Review Program	X	X					
Case Study School Districts	X	X	X	X	X	X	X

SOURCE: Prepared by the panel.

It is expected that ACS-based estimates for small areas will be subject to relatively large sampling errors. One way to address sampling errors is to make use of so-called small-area estimates. The Census Bureau manages the Small Area Income and Poverty Estimates (SAIPE) Program, which produces estimates for the number of school-age children whose families have income no greater than the poverty threshold for all school districts in the country. As discussed in detail in Chapter 5, the panel will consider whether the methodology used to prepare SAIPE estimates can be modified to derive the eligibility estimates needed for the school meals programs. This chapter provides an introduction to the SAIPE program.

The panel is charged with developing methodology to produce estimates for school districts and for school attendance areas. The geographic data involved are the school district boundaries updated and maintained by the U.S. Census Bureau, as well as local school attendance boundary information that will be provided by the case study districts. This chapter describes the geographic support of the ACS and other surveys conducted by the Census Bureau. Data from the case study districts will also be used to assess the accuracy of estimates prepared by the panel and may be used to address timeliness issues. The data to be collected from the case study districts are described in more detail in Chapter 4.

AMERICAN COMMUNITY SURVEY

The American Community Survey is a new continuous survey that collects data on income, family composition, and other content that was previously ascertained 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 and future censuses will include 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 250,000 housing unit addresses every month from the Census Bureau's Master Address File, for a total of 3 million housing unit addresses every year. Each month, about half of the households receiving a questionnaire in the mail fill it out and mail it back in; non-responding households for which telephone numbers can be obtained are contacted using computer-assisted telephone interviewing (CATI). A one-third sample (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 97.9 percent in 2008.[1]

The goal of the ACS is to provide small-area estimates similar to 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. Every year beginning in late 2005, the Census Bureau releases ACS 1-year period estimates for states, counties, cities, school districts, and other geographic areas with at least 65,000 people. Beginning in late 2008, the Census Bureau also releases ACS 3-year period estimates for areas with at least 20,000 people. Finally, beginning in late 2010, the Census Bureau will release ACS 5-year period estimates for all geographic areas in Census Bureau databases, including block groups, census tracts, and small cities, towns, and school districts.

The ACS data provide the opportunity for constructing estimates of students who are eligible for free meals, reduced-price meals, 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 14,125 school districts currently in the Census Bureau's geographic inventory, only 892 had 65,000 or more residents in the 2000 census, and only 3,227 had more than 20,000 residents. Moreover, in medium- and large-sized 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 would need to be constructed by aggregating blocks to approximate the school boundaries as closely as possible.

There are numerous technical and procedural issues to consider in using the ACS for deriving eligibility estimates and establishing claiming percentages for the school meals programs. Four of the most important issues are (1) constructing geographic areas and determining school attendance, (2) determining eligibility from ACS data, (3) minimizing sampling variability, and (4) enhancing timeliness. Subsequent chapters discuss in detail these issues and our approaches to investigating them.

1. Constructing Geographic Areas and Determining School Attendance. The ACS collects information about school attendance: whether attending within the last 3 months, public or private, and grade (or grade range). Hence, for a given public school attendance 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. However, as discussed at the end of this chapter, it can be challenging to align the

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[1] See http://www.census.gov/acs/www/acs-php/quality_measures_response_2008.php [accessed May 2010].

geographic information of the ACS (census blocks) with the geographic information used by school districts to identify school attendance areas. Moreover, as shown by Saporito and Sohoni (2007), charter, magnet, and other such schools may draw students from throughout a school district, altering the distribution of students attending the neighborhood public schools.

2. Determining School Meals Eligibility from ACS Data. The ACS collects data on gross money income for household members ages 15 and older, so it is possible to compare a family's income with 130 percent and 185 percent of the applicable poverty guideline to determine its income eligibility status. However, the ACS income data pertain to the previous 12 months, whereas eligibility for the school meals programs is based on a current month's income.

The ACS also collects information about the receipt of Supplemental Nutrition Assistance Program (SNAP) benefits and the receipt of other welfare income. The receipt of SNAP benefits confers categorical eligibility for free school meals. However, other welfare income is "the amount of any public assistance or welfare payments from state or local welfare offices." Although it might include payments from Temporary Assistance for Needy Families (TANF), which confers eligibility, it might also include payments from programs that do not confer eligibility.

Another challenge in using the ACS data on benefit receipt and, more generally, ACS income data, is reporting error. The ACS is no exception to the well-known fact that survey respondents tend to underreport sources of income, including substantial underreporting of public assistance benefits (see Czajka and Denmead, 2008; Meyer and Sullivan, 2009).

3. Minimizing Sampling Variability. As illustrated in Chapter 5, ACS estimates can have large sampling errors for small geographic areas, including nearly all school attendance areas and many of the nation's school districts. Large sampling errors would make it difficult for a district to assess the attractiveness of proposed Provision 4. Moreover, after adoption of Provision 4, variability in estimates could cause a district to be substantially under- or over-reimbursed from year to year.

Later chapters discuss approaches to reducing sampling variability. A leading candidate is to use small-domain estimation methods, as in the Census Bureau's SAIPE program, to improve the precision of estimates through statistical modeling and the incorporation of auxiliary data. Another approach is to aggregate data over time (as in the production of ACS 5-year period estimates) or over geographic areas (as in the aggregation of schools to form school groups within a district).

4. Enhancing Timeliness. At present, under Provision 2, percentages of meals served to free, reduced-, and full-price approved students in a base year are used to establish claiming percentages for a minimum of 3 future years. Under Provision 3, reimbursement for 4 future years is based on the number of meals served by category during the base year multiplied by a factor to adjust for changes in enrollment. If ACS 5-year period estimates replaced usage-based percentages for a base year, the claiming percentages would be more out of date than under current practice for the base and future years. Statistical modeling and adjustment methods to ameliorate this problem are discussed in later chapters.[2]

ADMINISTRATIVE DATA FOR THE SCHOOL MEALS PROGRAMS

FNS collects state-level counts related to the school meals programs on the Report of School Program Operations, Form FNS-10, which is completed by the relevant state agency. The form has two parts. Part A, required to be submitted monthly, shows the number of meals served in the state under the school lunch and breakfast programs 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 residential child care institutions (RCCI). Also included are counts of pubic schools, private schools, and RCCIs that participate in the school meals programs (by program) and the enrollment of those schools. For the National School Lunch Program (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 are required to be kept for 3 years. FNS provides summary information on its website at http://www.fns.usda.gov/pd/cnpmain.htm [accessed May 2010].

FNS collects data on verification activities on the School Food Authority Verification Summary Report, Form FNS-742. The form is available at http://www.fns.usda.gov/cnd/Governance/Forms/SFA_Verification_Summary.pdf [accessed May 2010]. With few exceptions, each school district that oper-

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[2]Another issue of timeliness is that the ACS collects income data for the 12 months preceding the interview, so the income data for a specific year include reference periods that range from the previous calendar year for households interviewed in January to 11 months of the calendar year and 1 month of the previous year for households interviewed in December. The Census Bureau inflates all income amounts to express them in current dollars for the middle of the year, but in periods of rapid economic change for local areas, the ACS income data will lag behind.

ates the 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 is the number of schools operating the NSLP or the SBP and the enrollment of those schools. The total number of free certified and reduced-price certified students are reported. In addition, the numbers of free certified students are separately identified as (1) not subject to verification (directly certified, homeless liaison list, income eligible Head Start, pre-K Even Start, residential students in RCCIs, nonapplicants approved by local officials); (2) certified based on a SNAP/TANF/FDPIR (Food Distribution Program on Indian Reservations) case number submitted on an application; (3) certified based on income reported on an application; and (4) certified in Provision 2 and Provision 3 schools not operating in a base year. The number of reduced-price certified students is also separately identified for Provision 2 and Provision 3 schools not operating in a base year.

  Section II of Form FNS-742 provides information about verification. For each outcome, three counts are reported: 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 certified for reduced-price meals. 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 reapproved on or before February 15. For each outcome, the form also collects data on the number of applications and the number of students. Data from Form FNS-742 are maintained by FNS and used to prepare summary reports of verification activities.

COMMON CORE OF DATA

  The Common Core of Data (CCD), a program of the U.S. Department of Education's NCES, annually conducts five surveys to collect fiscal and nonfiscal data about all public schools, public school districts, and state education agencies in the United States. The CCD 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 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 that describes schools and school districts, including 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 information from the CCD are the school and school district counts of enrolled students, students certified for free lunches, and students certified for reduced-price lunches. The school district fiscal data from the School District Finance Survey may also be useful. These data include revenues by source and expenditures by function and subfunction (including school meals).

Other potentially relevant NCES data include special tabulations of the ACS by school district geography prepared by the Census Bureau for NCES. These tabulations provide detailed demographic characteristics of the nation's public school systems. However, the economic characteristics tables that present data related to poverty levels allow one to look at only those below the poverty level and at or above the poverty level and not the near-poverty levels (130 percent and 185 percent) relevant to school meals eligibility.[3]

SURVEY OF INCOME AND PROGRAM PARTICIPATION

SIPP is the only major household survey that collects information on both annual income and changes in monthly income. Hence, it may provide an important source of information for the panel concerning the relationship between school meals eligibility estimated from annual income (as measured by the ACS or other surveys) and eligibility estimated from monthly income, as is done in the NSLP and the SBP. Moving forward, the major concern with the redesigned SIPP is whether the event history calendar method with annual interviews will capture changes in income in the same way as the current design with 4-month interviews (see National Research Council, 2009).

SIPP is a continuing program of the U.S. Census Bureau, which began interviewing for the survey in late 1983 and is planning to introduce a major redesign in 2013. Under its current design, in which members of sampled households (panels) are interviewed every 4 months for 3 or 4 years, SIPP not only provides detailed annual and subannual 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. Programs covered in SIPP include SNAP, NSLP, SBP, TANF, and many others. In addition, SIPP collects data on taxes, assets, liabilities, labor

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[3]Census Bureau tabulations from the ACS typically use the Office of Management and Budget statistical poverty levels which are similar to, but not exactly the same as, the Department of Health and Human Services poverty guidelines, which are used for school meals eligibility determination.

force participation, general demographic characteristics, and many special topics related to families' economic circumstances.

The survey design is a continuous 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 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 modules on particular topics asked one or more times per panel. The survey uses 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 telephone thereafter using a computer-assisted interview on a laptop computer. Data are currently released in cross-sectional core and topical module files for each interview wave. Core files are available through Wave 2 of the 2008 panel; topical module files are available through Wave 8 of the 2004 panel (see http://www.sipp.census.gov/sipp_ftp.html#sipp [accessed May 2010]).

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.

SMALL AREA INCOME AND POVERTY ESTIMATES PROGRAM[4]

The No Child Left Behind (NCLB) Act of 2001 directs 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 are produced by the Census Bureau's SAIPE program. SAIPE

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[4]This section comes from documentation found on the Census Bureau's website, with some minor editing. See http://www.census.gov/did/www/saipe/methods/schools/data/20062008.html [accessed May 2010].

estimates, which were first developed in the late 1990s (see National Research Council, 2000a, 2000b), are currently based on data from the ACS, the 2000 census, SNAP, aggregated federal income tax data, and a series of statistical models. The 2007 and 2008 estimates correspond with 2007-2008 school district boundaries, while the 2009 and 2010 estimates will correspond with 2009-2010 school district boundaries.

Annual SAIPE estimates of related children ages 5-17 living in families with income below the poverty line are used in allocating $14 billion to school districts for Title I of NCLB.[5] As described in more detail below, the school district estimation process uses the estimated number of school-age children in poverty in a county 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-level and state-level regression equations use administrative records data and 2000 census long-form sample estimates to predict school-age poverty for each county or state.

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 time schedule is only a few months later than the release of direct 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 guidelines that determine eligibility for free or reduced-price school meals. Therefore, as discussed in Chapter 5, we will investigate the development of SAIPE-like models for deriving estimates of students who are eligible for free or reduced-price meals in the school meals programs.

SAIPE Estimation Process

The SAIPE estimation process involves several steps. First, state-level poverty estimates are made for ages 0-4, 5-17, 18-64, and 65 and older.

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[5]Related children are people who are ages 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.

There are two equations for ages 5-17, one for all children, and one for related children.[6] These estimates are based on a weighted average of direct ACS estimates and a prediction from a regression model. The dependent variable in the model is the ACS 1-year direct estimate.[7] Independent variables include the poverty rate from the 2000 census, the tax return poverty rate, the tax return nonfiler rate, a SNAP participation ratio, and the Supplemental Security Income (SSI) receipt rate. The regression-based and ACS-based estimates are combined, weighting each based on the uncertainty associated with it, with the more uncertain estimate having the smaller 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 made. 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 ACS and model estimates is based on the uncertainty associated with each estimate. For counties that have 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 is larger than the latter.

Finally, school district-level estimates are made. For each school district, estimates are derived for the total population, children ages 5-17, and related children ages 5-17 in families in poverty. Margins of error are not

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[6]Footnote 5 defines related children. They are children who are related by birth, marriage, or adoption to the householder.

[7]ACS direct estimates are estimates produced for a population group, time frame, and geography based only on ACS data and the ACS methods documented by the U.S. Census Bureau.

currently provided for school district-level estimates, although research on the estimation of standard errors for them is under way.

The 2008 school district estimates were 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.

Grade Ranges of School Districts

For each school district, SAIPE estimates pertain to all resident school-age children (ages 5-17 inclusive), whether enrolled in public or private school or not enrolled. Where two districts divide the children of an area between them by grade, the estimates do so as well. In particular, some states have areas with separate "elementary" and "secondary" school districts, each exclusively responsible for providing education in some grades in their shared territory.[8] In these areas, data for school-age children are allocated between districts on the basis of the grade range of the district and the grade assigned to the child.

In most areas, "unified" districts are responsible for providing education for all elementary and secondary grades—either by operating schools themselves or by purchasing instruction from neighboring school districts—for all residents of their territory. In these areas, data for all children ages 5-17, inclusive, are tabulated in the district in which they reside.

There are also some states that have school districts with different grade ranges in different parts of a district's territory.[9] In most cases, these are districts that are unified in part of their domain and secondary in the rest. The final tabulations and estimates reflect the combination of data honoring these distinctions.

Grade ranges for each district are collected during the boundary update and supplemented with phone calls to districts. SAIPE attempts to assign a single grade range to each district that, in the case of spatially overlapping districts, leaves no grade unclaimed and no grade claimed by more than one district. Occasionally, the pattern of grade ranges of over-

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[8]States with districts that may overlap include Arizona, California, Connecticut, Illinois, Kentucky, Maine, Massachusetts, Montana, New Hampshire, New Jersey, New York, Oregon, Rhode Island, South Carolina, Tennessee, Texas, Vermont, and Wisconsin.

[9]States in which grade ranges may differ within a district include California, Kentucky, Massachusetts, Oregon, South Carolina, Tennessee, and Texas.

lapping districts does not permit each grade to be assigned to exactly one and only one district. In these few instances, three rules are applied:

1. If a "unified" district is present, data for children whose assigned grade is claimed by two districts or not claimed by either are allocated to the unified district.
2. If "elementary" and "secondary" districts are present, data for children whose assigned grade is claimed by both are allocated to the secondary district.
3. If "elementary" and "secondary" districts are present, data for children whose assigned grade is claimed by neither are allocated to the elementary district.

Constructing the SAIPE School District Estimates

The SAIPE program procedure for deriving school district estimates works with geographical units called "school district–county pieces." These pieces are defined as the intersections of school districts and counties—that is, all of a district if it does not cross county boundaries and each county part separately for districts that do. If a school district has territory in two counties, for example, estimates are made for the two parts separately and then combined.

For each school district piece, the tax-based child poverty rate is estimated, by using federal tax information obtained from the IRS, as the product of the county poverty rate for related children ages 5-17 and the ratio of the share of county "child tax–poor exemptions" to the share of "child tax exemptions" for the school district piece. For the 2008 school district estimates, the number of child tax exemptions and the number of child tax–poor exemptions were obtained from tax year 2007 IRS income tax data. For the 2007 school district estimates, tax year 2006 IRS income tax data were used. "Child tax–poor exemptions" are defined as the number of child tax exemptions on returns whose adjusted gross income falls below the official poverty threshold for a family of the size implied by the number of exemptions on the tax return. Because the age of each child is not reported on the income tax return, 2000 census estimates are used to adjust the IRS estimates to reflect the grade range of a school district (U.S. Census Bureau, 2007).

The school district piece poverty rate is multiplied by the official estimate of the relevant child population for the school district piece to obtain a poverty count for the school district piece. These counts are then ratio adjusted to agree with the SAIPE county estimates for the number of children ages 5-17 in poverty. Finally, the adjusted school district piece estimates are further adjusted using "controlled rounding" to obtain integer

values while still ensuring that pieces add up to SAIPE county totals. The final step is to reassemble the school district pieces into school districts by adding their controlled and rounded numbers of children in poverty.

GEOGRAPHIC DATA

For ACS and other surveys conducted by the Census Bureau, the corresponding geographic support is the Census Bureau's Topologically Integrated Geographic Encoding and Referencing (TIGER) database, which is a digital map of streets and other features. The accuracy of TIGER has recently been 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.

SAIPE provides poverty estimates for all school districts that are in the TIGER database, updated by the School District Review Program, which was conducted most recently in 2008. The next update will be completed in 2010. SAIPE also tabulates and produces estimates for all occupied areas not assigned to any school district in a county. These areas are referred to as "balances" of the counties in which they occur, whether they compose a single compact area or not. Although estimates for "balance of county" areas are not published on the SAIPE website, they are provided to the U.S. Department of Education for implementing provisions of NCLB and are available upon request.

The panel is developing a methodology that could produce estimates for school attendance areas of students eligible for free or reduced-price school meals for use in a new Provision 4 for federal reimbursement of meal costs. Because the Census Bureau does not maintain geographic data on school attendance-area boundaries, to obtain and evaluate such estimates under its proposed methodology, the panel will need to provide digitized school attendance-area boundaries of sufficient accuracy to the Census Bureau. The panel expects to obtain digitized school attendance boundaries directly from case study districts (see Chapter 4).

Direct estimates for schools or groups of schools will probably have to be derived by aggregating ACS block sample data and weighting it. For some schools, however, the attendance boundaries will run through blocks and statistical algorithms for splitting block groups may need to be developed and evaluated. Goodchild, Anselin, and Deichmann (1993) describe methods for such approximations. Geverdt (2005) documents the work done to develop digitized boundaries in Philadelphia for developing estimates of school meal eligibility based on the 2000 census.

The School Attendance Boundary Information System (SABINS) (National Science Foundation, 2009) is a 2-year proposal by Salvatore Saporito that received funding from the National Science Foundation in 2009. The project is to establish a spatial database of school attendance boundaries for the 800 most populous school districts in the country. SABINS data are planned to be distributed via the National Historic geographic information system website (see http://www.nhgis.org/ [accessed May 2010]). The intention is that these boundaries would be compatible with the TIGER database to facilitate social science research. If this project is successful, it may make it easier for school districts to obtain accurate digitized school attendance boundaries.

4

Conceptual Framework and Design of School District Case Studies

Our panel's charge is not only to develop methods for using available data to estimate claiming percentages for reimbursement by the U.S. Department of Agriculture (USDA) for school breakfasts and lunches under a new Provision 4, but also to evaluate the usefulness of the resulting estimates for school districts that might want to consider adopting such a provision. There are well over 13,000 school districts in the United States, which are highly diverse in their size and the socioeconomic characteristics of their students. These differences will affect the attractiveness of Provision 4, in which data from the American Community Survey (ACS) and other sources would provide the basis for claiming percentages for a school, group of schools, or school district that provides free meals to all students in return for not having to accept or verify applications or categorize meals in the cafeteria line.

FRAMEWORK FOR CLASSIFYING SCHOOL DISTRICTS

To help understand school district differences more systematically in planning our technical approach and, specifically, designing case studies, we developed a framework for classifying school districts and identifying the geographic level of the estimates that would be needed to assess the impact of operating under Provision 4. At this point, we are focusing on just three school district characteristics that are relevant to our assessment: (1) students' need for assistance (as measured by the percentage of students who are approved for free and reduced-price meals),

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(2) the heterogeneity of need across schools within the school district, and
(3) school district size (as measured by enrollment).

Key School District Characteristics

Need: For a school district with very high need, the savings associated with eliminating the application and verification processes and the process of distinguishing free, reduced-, and full-price meals in school cafeteria lines is likely to equal or exceed the additional costs of providing free meals to all students who take such meals.[1] For such a school district, Provision 4 is likely to be attractive, assuming that the estimates of claiming percentages from the ACS and other sources satisfy other criteria, such as timeliness and accuracy. In contrast, a school district with very low need is not likely to be interested in Provision 4, regardless of the quality of the ACS-based estimates, because the savings in administrative costs are likely to fall far short of the added meal costs. "In between" school districts face less clear-cut decisions.

Heterogeneity of need: In addition to the aggregate level of need within a school district, the heterogeneity of need across schools could affect a district's decision regarding Provision 4. A school district might have an "in between" level of need because it has some schools with high levels of need and other schools with low levels of need. Such a district might want to adopt Provision 4 in the first group of schools, but not the second. To assess the attractiveness of Provision 4 for this type of school district would require estimates for groups of schools within the district. In contrast, a district-wide estimate would be adequate to assess the attractiveness of Provision 4 for a homogeneous school district.

Enrollment size: The size of a school district will substantially affect the reliability of the estimate(s) on which to evaluate the attractiveness of Provision 4. For a large school district, the methods we set forth in Chapter 5 might yield reliable estimates for schools or groups of schools. For a small school district, however, it might not be possible to derive estimates with acceptable reliability below the school district level, even using statistical modeling. If that is the case, the attractiveness of Provision 4 would have to be evaluated on the basis of an estimate for the entire school district, although that estimate might not be reliable.

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[1]According to the Food Research and Action Center, "Schools that have implemented Provision 2 or 3 have found that they can offset cost differentials with as few as 60 to 75 percent of students eligible for free or reduced-price school meals" (see http://www.frac.org/html/ federal_food_programs/cnreauthor/provision2.htm [accessed May 2010]).

Matrix of need, heterogeneity of need, and enrollment size: Table 4-1 shows how the universe of U.S. school districts is distributed across combinations of need, heterogeneity of need, and enrollment size, as defined below. We specified the boundaries of these categories pragmatically, with their primary purpose to partition school districts for purposes of this study.

Need:
- Low: Less than 50 percent of students are approved for free or reduced-price meals.
- Medium: Between 50 and 75 percent of students are approved for free or reduced-price meals.
- High: At least 75 percent of students are approved for free or reduced-price meals.

Heterogeneity of need:
- Heterogeneous: At least 25 percent of schools in the district have 75 percent or more of their students approved for free or reduced-price meals, and at least 25 percent of schools have less than 50 percent of their students approved for free or reduced-price meals.
- Homogeneous: Not heterogeneous.

Enrollment size:
- Large: Student enrollment greater than or equal to 25,000.
- Medium: Student enrollment greater than or equal to 12,000 and less than 25,000.
- Small: Student enrollment less than 12,000.[2]

As shown in Table 4-1, almost 70 percent of school districts are in the "low-need, homogeneous" category for which Provision 4 is unlikely to be attractive. Very few school districts (less than 1 percent) are either "low need, heterogeneous" or "high need, heterogeneous," which is not surprising given the definition of those categories. The remaining districts are distributed into 21 percent "medium need, homogeneous," 6 percent "high need, homogeneous," and 2 percent "medium need, heterogeneous."[3]

The categorization of school districts in Table 4-1 was created to guide

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[2]We note that 12,000 is roughly the median enrollment when school districts are weighted by enrollment; that is, school districts with greater than 12,000 enrollment cover about half of the students in the country.

[3]The distribution in Table 4-1 is of districts, not enrollment; a table of enrollment would indicate that high-need districts, which are most likely to find Provision 4 attractive, enroll a significant proportion of students.

TABLE 4-1 Number and Percentage of School Districts in the United States by Need, Heterogeneity of Need, and Enrollment Size

Need: School District Percentage Approved for Free or Reduced-Price Meals

Enrollment Size	Low < 50%		Medium 50-75%		High ≥ 75%	
	Homogenous Schools	Heterogeneous Schools	Homogenous Schools	Heterogeneous Schools	Homogenous Schools	Heterogeneous Schools
≥ 25K	168 (1.2%)	5 (0.0%)	53 (0.4%)	32 (0.2%)	23 (0.2%)	1 (0.0%)
12-25K	265 (2.0%)	8 (0.1%)	83 (0.6%)	33 (0.2%)	33 (0.2%)	0 (0.0%)
< 12K	8,969 (66.4%)	90 (0.7%)	2,713 (20.1%)	189 (1.4%)	816 (6.0%)	26 (0.2%)
Total (%)	69.6	0.8	21.1	1.9	6.5	0.2

NOTE: See text for definitions of need, heterogeneity of need, and enrollment size.
SOURCE: The universe for this table includes each school district on the 2007-2008 Common Core of Data (CCD) for which the Census Bureau prepared a Small Area Income and Poverty Estimate Program estimate for Title I allocations under the No Child Left Behind Act. There were 13,507 such school districts. The CCD data were used to classify the school districts (the data are available at http://nces.ed.gov/ccd/index.asp [accessed May 2010]).

the development of our technical approach and, in particular, the selection of school districts for case studies. It was not designed to predict whether specific districts would adopt Provision 4. For determining how every school district would in practice approach its decision about adopting Provision 4, it is likely that our categorization would misclassify some districts. For example, some districts classified as homogeneous according to Table 4-1 might nonetheless want to adopt Provision 4 for only one or a few schools in the district. However, the panel requires only an approximate identification of school districts by need, heterogeneity of need, and enrollment size to develop its technical approach and select school districts for case studies.

Information Needs for Assessment

Table 4-2 shows, in a very simplified way, the geographic level of estimates that would be needed for different types of districts to assess the attractiveness of adopting Provision 4. For the sake of simplicity, we have assumed that only districts with medium need can be heterogeneous. Low-need and high-need districts are assumed to be sufficiently low and high, respectively, that there cannot be much variation in need across the schools within the district. We have also assumed that low-need districts are sufficiently low that they could not break even under Provision 4, and, thus, the provision would not be attractive to them. Consequently, there is no need to examine estimates of claiming percentages based on the ACS and other data sources for school districts in any of the low-need cells.

For high-need districts, the attractiveness of Provision 4 can be assessed on the basis of a district-wide estimate of need because there is little within-district heterogeneity.[4] Similarly, the attractiveness of Provision 4 for homogenous medium-need districts can be assessed on the basis of district-wide estimates.

In contrast, a heterogeneous district with medium aggregate need is likely to require estimates for individual schools or groups of schools to assess the effects of heterogeneity on the attractiveness of adopting Provision 4 for only some schools in the district. Obtaining such estimates would require input from the school district on attendance-area boundaries and other aspects of the district's schools, making such districts ideal candidates for case studies in contrast to other districts for which district-wide estimates would suffice.

Finally, reflecting the discussion of ACS sampling error in Chapter 5, Table 4-2 indicates that while it might be possible to derive reliable esti-

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[4]If a district is high need, Provision 4 is likely to be attractive from a financial point of view, as discussed above.

TABLE 4-2 Geographic Level of Estimates Required to Evaluate Provision 4 for School Districts by Need, Heterogeneity of Need, and Enrollment Size

Need: School District Percentage of Students Eligible for Free or Reduced-Price Meals

Enrollment Size	Low		Medium		High	
	Homogenous Schools	Heterogeneous Schools	Homogenous Schools	Heterogeneous Schools	Homogenous Schools	Heterogeneous Schools
Large	X	—	D	S / G	D	—
Medium	X	—	D	G	D	—
Small	X	—	D	—	D	—

D = District estimate.
S = School estimate.
G = School group estimate.
X = No estimate (will not consider a special provision).
— = (Nearly) empty cell (very few such districts).
NOTE: See text for definitions of need, heterogeneity of need, and enrollment size.
SOURCE: This table summarizes information displayed in Table 4-1 and reflects the panel's interpretation.

mates for individual schools in some large, heterogeneous districts with medium need, it is more likely that reliable estimates could be derived for groups of schools in medium-sized and even many large districts. Although we have assumed, for the sake of simplicity, that small districts are too small to be heterogeneous, there are, in fact, close to 200 such districts (see Table 4-1). However, as discussed in Chapter 5, they are too small to make it likely that reliable estimates could be derived for groups of schools, let alone individual schools, in such districts. Consequently, the universe for case studies is the medium-sized and large school districts with medium aggregate need and heterogeneity of need across schools in the district. Such districts are likely to consider Provision 4 for a substantial fraction of schools—but significantly fewer than all schools—and therefore require estimates for individual schools and groups of schools.

Although the analysis reflected in Table 4-2 may be oversimplified and might not accurately predict the behavior of individual school districts as they consider Provision 4, it has helped us in our immediate purpose of developing a technical approach. Specifically, it has helped guide our selection of districts for case studies. It also helps motivate the approach to exploring alternative methods for deriving estimates presented in Chapter 5 and, in particular, distinguishing the problem of deriving estimates for entire school districts from the problem of deriving estimates for individual schools or groups of schools within a district. Next, we discuss how we selected districts for case studies, the information we will request from them, and how the data will be used.

CASE STUDIES

Selecting Case Study Districts

As discussed in Chapter 3, data on school district boundaries are readily available from the School District Review Program managed by the Census Bureau in collaboration with the National Center for Education Statistics (NCES). Every 2 years, state officials are invited to review the Census Bureau's school district information and to provide updates and corrections to the school district names, identification numbers, school district boundaries, and the grade ranges for which a school district is financially responsible. As a result, no new geographic information is needed for the Census Bureau to prepare estimates for school districts according to the methods described in Chapter 5.

For levels of geography that are not included in its geographic database, the Census Bureau can provide estimates (subject to disclosure review) if the customer provides digitized boundary information that accurately aligns with the bureau's mapping of streets and other features.

Although our panel could not collect digitized boundary information for school attendance areas from all school districts in the country, we can obtain such information for a small set of case study districts. For the selected school districts, the panel will evaluate the accuracy of the digitized boundary information provided by the districts and work with the Census Bureau to derive estimates for school attendance areas and groups of school attendance areas using the methods described in Chapter 5. Then, as discussed in Chapters 6 and 7, the panel will evaluate the estimates and assess the operational feasibility of the estimation methods.

Consonant with the resources for our work, the panel proposes to invite six school districts to participate in our study as case studies. We will collect digitized school attendance boundary information, as well as information about program participation and costs for the school meals programs for each school in the school district. The panel will test its approaches for using ACS and other data to estimate eligibility and participation for each school in the district and for the school district as a whole. The panel will compare the ACS-based estimates to administrative data and will work with school and school district officials to evaluate the results and assess the potential costs and benefits of adopting Provision 4. The panel will also work with school district officials to assess how schools might be grouped to improve the precision of estimates and operate their school meals programs under Provision 4. The panel will work with the case study school districts to better understand the potential challenges associated with Provision 4.

To ensure that estimates can be derived for school attendance areas and to facilitate evaluation of the estimates, the panel will select for case studies only school districts that satisfy the following requirements:

- Must have taken applications for all schools in the district for the past 5 years (i.e., cannot already be under a special provision that eliminates taking applications), to allow comparisons to the 5-year ACS estimates.
- Must have no outstanding counting/claiming issues—to enhance the accuracy of comparisons between survey and administrative estimates.
- Must be willing and able to provide the following data for each school:
  - o digitized school attendance-area boundaries of acceptable accuracy;
  - o state/federal school identification number;
  - o grade span;
  - o total enrollment and enrollment in each grade;

    o   total students certified for free, reduced-, and full-price meals for the following categories: directly certified, categorically eligible but not directly certified, income eligible but not categorically eligible; and

    o   total meals (breakfast and lunch) claimed by category (free, reduced-, and full price).

As described earlier, the panel decided that case studies should be selected from the medium-need, heterogeneous school districts in Table 4-1. We are interested in such school districts because they are likely to consider adopting Provision 4 for only some schools. From among the medium-need, heterogeneous school districts, we want to have districts that vary in terms of enrollment but are 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. Within this group, we planned to select four large school districts (enrollment of at least 25,000) and two medium-size 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 panel selected six case study districts and invited them to participate in the study. The school districts listed in Table 4-3 are the five that have agreed to participate as case study districts as of the date of publication of this report.

It is expected that at least one case study district[5] will have a substantial fraction of students attending magnet or charter schools with attendance areas that might be district-wide or at least overlap the attendance areas of many neighborhood schools. Working with such a school district will enable the panel to consider alternative ways of accounting for charter and magnet school students when estimating eligibility and

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[5]Charter and magnet schools that draw from a district can be part of that school district, or they can be independent local education agency/school food authority. For example, based on information from the website of the Austin Independent School District (AISD) and the public charter school dashboard of the National Alliance for Public Charter Schools, it appears that the public charter schools in Austin have about 6 percent of public school students in Austin, although the charter schools are not part of the AISD.

TABLE 4-3 Case Study Districts

School District	Number of Schools	Number of Students (in thousands)
Austin, TX	119	83
Chatham, GA	49	34
Norfolk, VA	52	35
Omaha, NE	92	48
Pajaro Valley, CA	33	19

SOURCE: Data from NCES Common Core of Data, 2007-2008, see http://nces.ed.gov/ccd/ [accessed May 2010].

participation based on the geographic residence of a student rather than on information about the specific school the student attends.[6]

Recruiting Case Study Districts

The panel contacted state directors of the potential case study districts to describe our project and to ask for their assistance. A copy of the letter was also sent to the appropriate regional office of the Food and Nutrition Service (see Attachment A). With the approval of state directors, the panel contacted school district staff. To facilitate the development of our case studies, the panel obtained the support of the School Nutrition Association (SNA) for this project. The incoming president of SNA wrote a letter that was included with the panel's letters to state directors and to school district officials (see Attachment B).

Case Studies Data Collection and Analysis Plan

As noted above, the panel will obtain from each case study district digitized boundaries for school attendance areas and detailed data for each school on enrollment, students approved for free and reduced-price meals, and reimbursable meals served. Furthermore, using a protocol such as that in Attachment C, the panel will collect additional information, including information pertaining to school food service revenues and the procedures and costs for operating the school meals programs.

The first part of the analysis of case studies will be to evaluate the accuracy of school district attendance-area boundaries. The digitized boundaries provided by school districts may not correspond to the Census Bureau's defined blocks or block groups, which are the basic units for geo-

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[6]Other situations that draw students from neighborhood schools include home-schooling, open enrollment, and other school choice programs.

graphic aggregation. There are, however, well-defined methods for inter-
polating statistical estimates that cut standard reporting zones based on a
range of possible assumptions (Goodchild, Anselin, and Deichmann, 1993).
This activity will involve collaboration between the panel, school district
officials, and geographers at the Census Bureau.

The second part of the analysis will involve obtaining estimates of
eligibility and participation from the ACS and other sources using the
methods outlined in Chapter 5 for school attendance areas and whole
school districts. These estimates will be compared with school-level
and school district-level administrative data and assessed for bias and
precision as described in Chapter 6. The panel will also consider esti-
mates for groups of schools as defined in collaboration with school
district officials.

The third phase of the analysis will be to use the estimates of eligibil-
ity and participation as the basis for hypothetical claiming percentages for
reimbursement under Provision 4. The implied hypothetical reimburse-
ments will be assessed relative to reimbursements under the traditional
approach (which the case study school districts are using now). Based
on estimates provided by the districts for the costs of administrative
processes that would be eliminated under Provision 4 (certification, veri-
fication, and meal counting by category), differences between costs and
reimbursements can be compared for the traditional approach and Provi-
sion 4. The panel hopes to use this information to describe situations that
render Provision 4 more or less attractive to school districts. Finally, the
panel will consult with case study districts and states to identify current
uses of data on the numbers of students who are approved for free and
reduced-price meals to further illuminate the potential impact of Provi-
sion 4.

In addition to providing information to and collaborating with the
panel, the case study school districts will be invited to participate in a
workshop to be held in Washington, DC, in October or November 2010.
This workshop will provide staff from each case study school district
with the opportunity to present information about special features of the
district and reactions to Provision 4, while interacting with staff from
the other case study districts, panel members, and other attendees.

ATTACHMENT A
EXAMPLE OF LETTER TO STATE OFFICIAL

Dear Texas State Director:

The Food and Nutrition Service (FNS) of the U.S. Department of Agriculture has asked the National Academy of Sciences (NAS) to establish an expert panel to study the possibility of using data from the U.S. Census Bureau's American Community Survey (ACS) to estimate the percentage of children eligible for the free and reduced-price school meals programs within school districts and school attendance areas. Descriptions of the panel's technical approach and membership are attached. FNS seeks to determine whether the estimates will be sufficiently accurate to be used as the source of meal claiming percentages for a voluntary universal feeding provision. The findings of this study will be used to inform Congress and policy makers as they explore options for expanding alternatives to paper applications.

One of the tasks of the panel will be to develop illustrative estimates of eligibility rates for school attendance areas in six case study districts in the United States, to compare them to school-level data, and to evaluate costs and benefits of the methodology. Results of the analysis will be shared with the case study districts. The panel believes that the state of Texas has a number of districts that are good candidates to serve as a case study.

The panel would like your support in selecting a Texas case study school district and gaining the district's cooperation. The panel is fortunate to have John Perkins, former senior director of the Child Nutrition Programs Division with the Texas Education Agency and Assistant Commissioner for Food and Nutrition with the Texas Department of Agriculture, as a member. He has agreed to help us work with a Texas school district in obtaining the data we need, and to provide coordination, collaboration, and feedback to the district. As NAS study director, I will also be working with individuals from the selected district.

Advantages to District

Case study districts will be the first in the nation to fully understand what an ACS-based approach to eligibility determination might mean for them specifically. They will receive eligibility estimates for their schools and groups of schools prepared in support of this study that have passed the confidentiality review of the U.S. Census Bureau. They will inform and receive the results from an assessment of costs and benefits. Someone from the district will be invited to participate in a workshop to be held in Washington, DC, to discuss the project and its implications for the district.

Requirements for Case Study District

A school district must satisfy the following requirements:

- Be willing to collaborate with the panel.
- Have no outstanding counting and claiming issues.
- Have taken applications for free/reduced-price meals for the last 5 years and be able to provide data for each of those years on:
  - o number of students certified by meal category as of October (directly certified, categorically eligible but not directly certified, and income eligible but not categorically eligible), and
  - o number of meals claimed by category by month.
- Be able to provide digitized school boundary maps, the dates for which they are applicable, and a description of the methodology used to create them.
- Be able to provide a description of each public school (grade range, NCES ID, enrollment overall and by grade).
- Be able to provide the number of students not attending local public schools (charter and magnet, other public). It would be helpful if districts can provide the number of students residing in the district that attend private schools.

The panel is particularly interested in selecting as case study districts those for which participation in existing special provisions (such as Provisions 2 and 3) is not a clear choice. In particular, we thought districts with groups of schools with few students eligible for free or reduced-price meals and also with groups of schools with many students eligible for free or reduced-price meals would be good candidates.

With that as a criterion we tentatively selected the Austin school district to serve as the case study district from Texas; however, we are open to suggestions of another district. We are also interested in interviewing someone from the San Antonio school district to explore their reasons for ending the use of Provision 2.

Next Steps

The panel will be assessing costs and benefits associated with the ACS-based approach to determining eligibility. We would be interested in any information you may have at the state level concerning costs of the administrative processes (applications, verification, and meal counting) as well as expected changes in participation associated with providing universal feeding. John Perkins has provided some information to the panel on the latter. Perhaps you could direct us to knowledgeable individuals to talk to about these topics.

I very much hope that you can support this important project on behalf of the nation's schools and school children. I will call you in the next few days to set up a time to answer your questions, obtain your input, and discuss the best way to proceed. Alternatively, please phone or e-mail me using my contact information below. I am especially interested in determining the best contact procedure to reach the selected school district—whether you prefer to forward my letter to the district or to talk with the district directly. USDA and NAS see this as a very important public policy issue for the National School Lunch Program and School Breakfast Program. We recognize that states and school districts have many demands placed upon them, but hope that you will be able to work with us on this project, which has great potential for improving program access and reducing the paperwork burden on schools and parents.

Thank you so much for your time and attention to this important matter.

Sincerely,

Nancy J. Kirkendall, Ph.D.
Senior Program Officer
Committee on National Statistics
National Academy of Sciences
(202) 334-2303
nkirkendall@nas.edu

copy to:
Cindy Long, John Endahl, FNS
Director, SW Regional Office

ATTACHMENT B
LETTER OF SUPPORT FROM THE SCHOOL
NUTRITION ASSOCIATION

January 8, 2010

Dear School Nutrition Director:

The SNA leadership has reviewed a description of USDA and the National Academy of Sciences Committee on National Statistics' proposed program eligibility study and hereby registers its support for the collection of this information. Your school nutrition program has been selected as one of six school districts to serve as a case study for this project.

Convened at the request of the USDA Food and Nutrition Services (FNS), a panel of experts is charged with determining how to make use of the American Community Survey (ACS), a yearly census form, to estimate eligibility for the school meals programs. The purpose of these estimates is to develop percentages by which USDA would reimburse school districts for their expenses in providing free breakfasts and lunches to all children attending specified schools. The panel will consider the ability of the ACS to provide estimates for school attendance areas, built by aggregating estimates for census tracts and block groups. If such estimates are accurate, FNS may offer a new universal feeding provision that will make use of survey estimates for claiming percentages.

SNA believes that the data collected by this study will be of significant practical use in developing measures to expand access and program participation. We expect that the results of this study will contribute to efforts to streamline the programs, improve efficiency, and ensure that all children who are eligible for school meals receive them.

The National Academy of Sciences assures us that they have taken steps to minimize the reporting burden placed on districts participating in the study.

Sincerely,

Dora Rivas, R.D., S.N.S.
President

ATTACHMENT C
PROTOCOL FOR CASE STUDY DISTRICTS

SCHOOL DISTRICT AND SCHOOL DATA

1. District name, address, state ID, federal ID.
2. Contact person: Name, title, address, phone, e-mail.
3. For each school (campus) in the district for 2003-2004 through 2008-2009 provide data as of October 31 of the school year.
   a. School name, address, state ID, federal ID.
   b. Digital attendance areas (boundaries).
   c. Grade levels.
   d. Official enrollment by grade.
   e. Official attendance by grade.
   f. Is this school a severe-needs school under the School Breakfast Program (SBP)?
   g. Is this school eligible for the 2 cent incremental reimbursement for the National School Lunch Program (NSLP)?
   h. Number of students approved as free eligible and number approved as reduced-price eligible.
   i. Number of students directly certified for free meals, number categorically eligible but not directly certified and not requiring verification, and number categorically eligible identified by application.
   j. Number of students approved as free eligible and number approved as reduced-price eligible based on income and household size information submitted on an application.
   k. Meal count by free, reduced price, and full price for the month of October, separate for SBP and NSLP. Average daily participation for NSLP and SBP for October.
   l. Meal prices for NSLP and SBP paid meals.
4. Revenue that accrues to school food services for the district.
   a. School district annual revenue from reduced-price and full-price students for NSLP and SBP.
   b. School district annual revenue from students from à la carte snack bar, and other sales that are not part of SBP or NSLP.
   c. School district annual revenue from U.S. Department of Agriculture (USDA) reimbursements for NSLP and SBP.
   d. School district annual revenue from state (not USDA reimbursements) for NSLP or NSB.
   e. School district annual revenue from local sources (neither USDA nor state reimbursements) for NSLP and NSB.
   f. If there are other sources of revenue, please describe.

5. Alternative to 4. Total school district revenue that accrues to school food services.
   a. Percent of revenue that comes from student payments (reduced price and full price) for NSLP and SBP.
   b. Percent of revenue that comes from à la carte, snack bar, and other sales that are not part of NSLP or SBP.
   c. Percent of revenue that comes from USDA reimbursements for NSLP and SBP.
   d. Percent of revenue that comes from state reimbursement (not USDA) for NSLP and SBP.
   e. Percent of revenue that comes from local sources (neither USDA nor state).
   f. Percent of revenue from other sources (please describe).

SCHOOL DISTRICT DESCRIPTIVE QUESTIONS

Answer the following program questions for school year 2008-2009 only. (Note: this information may be collected in a telephone interview, perhaps sharing the questions in advance.) If there is a question that you cannot answer, please provide the name and contact information for the person who should know the answer.

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 percent of Supplemental Nutrition Assistance Program (SNAP) (formerly food stamp) students are identified by direct certification?
2. Are free and reduced-price applications processed centrally or by each school?
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?
5. Have you considered adopting NSLP Provision 2 or 3? Why or why not? What factors caused you to not adopt?
6. Does the district (or state) participate in other special pilots or provisions, such as the elimination of reduced-price fees? If so, please describe.
7. Provide a summary of findings on your last Coordinated Review Effort (CRE), and the Corrective Action Plan (CAP).
8. Please provide food service profit and loss reports for the school district, if available. Are profit and loss statements also available by school?

9. How are the digitized school areas (boundaries) determined and how frequently are they updated?
10. Would you be willing to provide the panel with results of geocoding student address lists using TIGER line files to evaluate an alternative approach to obtaining geographical information about and deriving estimates for school attendance areas?
11. 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).
12. 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?

STATE QUESTIONS

State level questions to be asked during telephone conversations with case study states. Initial contact is via letter to the state director who oversees school nutrition (chief state school officer).

1. At the state level, how do you use the data on free and reduced-price students?
2. Do you use the numbers in state allocation formulas? If so, what do you use in Provision 2 and Provision 3 districts where they no longer take applications?
3. What would be the impact if a district no longer took applications and relied on American Community Survey (ACS) data for claiming percentages?
4. Does your state maintain a database with the information from schools or school districts that are rolled up to complete the Form FNS-10 for the state? If so, for how many years are the data available? Can you separately identify the Provision 2 or Provision 3 schools or districts in the database? Can you identify the base years?
5. Has your state conducted an analysis to help schools determine whether they would benefit from Provision 2 or Provision 3? If so, can the panel obtain a copy?

5

Technical Approach to Estimation

T he panel's charge is to use data from the American Community
Survey (ACS) and other sources to develop claiming percentages
for reimbursement under a new Provision 4. As noted in Chap-
ter 3, several issues contribute to potential biases and must be addressed:
monthly income is the basis for eligibility, but annual income is measured
by the ACS; there are schools (such as charter and magnet schools) that
draw students from neighborhood schools, possibly changing the concen-
tration of eligible students in the neighborhood schools; ACS estimates
for small areas will be available only as 5-year averages and might not
be timely in reflecting changing economic conditions. Addressing these
issues will be a key challenge for the panel.

Another challenge is that ACS direct estimates for school attendance
areas and many districts are likely to have high sampling error. The
panel feels that the most fruitful approach to addressing this challenge
will be to build on the Census Bureau's Small Area Income and Poverty
Estimates (SAIPE) Program. The panel recognizes that this is a major
undertaking, requiring close collaboration with the Census Bureau. It
is also likely to require further research that probably cannot be accom-
plished within the time frame of our study. However, at a minimum, we
expect to be able to implement and test straightforward adaptations to
SAIPE methods and to assess the feasibility of a model-based approach
that would support the school meals programs. In addition, through the
case studies described in Chapter 4, the panel will obtain and evaluate
the accuracy of digitized school attendance boundary data and develop

methods for deriving estimates of eligible students for schools and groups of schools.

Finally, the panel will consider how to obtain participation-based claiming percentages from estimates of eligible students. This will rely on a review of existing research—including analyses conducted by states and school districts and evaluations of pilot studies—and the collection and analysis of administrative data from school districts that have adopted Provision 2. In the development and evaluation of methods, as described in this chapter and the next, the panel will consider the operational feasibility of potential approaches, as discussed in Chapter 7, and prioritize our work accordingly.

REIMBURSEMENTS UNDER PROVISION 4

Chapters 2 and 3 review basic features of the school meals programs and the ACS and sketch how ACS data might be used to determine federal reimbursements for a school, a group of schools, or an entire district that provides universal free meals under a new Provision 4. In Chapter 2, the potential role of ACS data in implementing Provision 4 was characterized by the following two reimbursement formulas:

$$G_{e\ t}^{\ 4} = R^f\,\frac{E^f}{E}\,M_t + R^r\,\frac{E^r}{E}\,M_t + R^p\,\frac{E^p}{E}\,M_t$$

and

$$G_{p\ t}^{\ 4} = R^f C^f M_t + R^r C^r M_t + R^p C^p M_t$$

where

- $G_{e\ t}^{\ 4}$ is the government outlay for reimbursable meals served in month t in Provision 4 schools, based on eligibility estimates, in dollars;
- $G_{p\ t}^{\ 4}$ is the government outlay for reimbursable meals served in month t in Provision 4 schools, based on eligibility and participation estimates, in dollars;
- R^f, R^r, and R^p are reimbursement rates for free meals, reduced-price meals, and full-price meals, respectively;
- M_t is the total number of reimbursable meals served in month t;
- E^f is the estimated number of enrolled students who are eligible for free meals based on ACS and other sources;
- E^r is the estimated number of enrolled students who are eligible for reduced-price meals based on ACS and other sources;
- E is the estimated number of enrolled students in Provision 4 schools based on ACS and other sources;

- $E^p = E - E^f - E^r$ is the estimated number of enrolled students who are eligible for full-price meals;
- C^f is the claiming percentage for free meals—it is an estimate for the fraction of meals served to students eligible for free meals;
- C^r is the claiming percentage for reduced-price meals—it is an estimate for the fraction of meals served to students eligible for reduced-price meals; and
- $C^p = 1 - C^f - C^r$ is the claiming percentage for full-price meals.

With the first formula, reimbursements would be enrollment-based—that is, they would be based on the estimated distribution of enrolled students across eligibility categories (free, reduced price, and full price). With the second formula, reimbursements would be participation-based—that is, they would be based on the estimated distribution of meals served across the eligibility categories.[1] As documented in Chapter 2, the enrollment and participation distributions are different, and a substantial concern is that the enrollment-based reimbursement formula would provide unfairly smaller reimbursements to districts than would the participation-based reimbursement formula.

Despite this concern and the fact that the enrollment-based formula is a special case of the participation-based formula, presenting both formulas is helpful for highlighting some of the challenges that arise in using ACS data. As noted in Chapter 3, a challenge in deriving eligibility estimates is that the data collected by the ACS can be used only to approximate the eligibility criteria for free and reduced-price meals. For example, while the ACS collects annual income data, program eligibility is based on monthly income, and once a student is approved for free or reduced-price meals, that approval remains in effect for up to 30 days into the next school year.

A challenge in deriving participation estimates is that the ACS collects no data to predict participation, beyond its information on eligibility. Hence, information about the relationship between the eligibility and participation distributions must come from other sources of data. Additional challenges that arise in using ACS data include identifying ways to enhance the precision and timeliness of estimates.

The rest of this chapter discusses the panel's plans to develop methods for estimating program eligibility from the ACS, adjust estimates to better reflect program eligibility criteria, improve timeliness and precision, and estimate claiming percentages that take participation into account. The chapter concludes with a discussion of the panel's approach to analyzing

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[1]As noted in Chapter 2, a special case of the participation-based formula estimates claiming percentages using the enrollment percentages from the enrollment-based formula.

the potential costs and benefits to a district of adopting Provision 4 in some or all of the districts' schools.

ACS DIRECT ESTIMATES OF ELIGIBLE STUDENTS

The ideal enrollment-based claiming percentages under Provision 4 would be the elements of E_T in Figure 2-1, that is, the percentages of students who are eligible for free, reduced-, and full-price meals under the rules of the school meals programs. Those percentages, however, are unobserved and need to be estimated. The ideal estimates would have very low variances and be nearly unbiased. As discussed in Chapter 3, ACS direct estimates might need "adjustments" to remove potential biases, such as a bias resulting from the ACS measuring of annual, rather than monthly, income. In addition, small-domain estimation methods might be needed to improve precision. Before exploring the use of such methods or adjustments for potential biases, we will seek to identify the best possible measure of eligibility using ACS variables.

In developing an approach to ACS direct estimation,[2] the panel's first empirical task will be to examine alternative combinations of ACS variables to determine which most closely reflects the eligibility criteria of the school meals programs. For a set of "test" districts—specifically, unified (K-12) school districts that can be identified in the ACS Public Use Microdata Sample files—we will derive estimates (and standard errors) of the following:

- total number of students (by public, private);
- number of students with family annual income no greater than 130 percent of poverty whose families do not receive Supplemental Nutrition Assistance Program (SNAP) or other welfare benefits (by public, private);
- number of students with family income greater than 130 percent of poverty and no greater than 185 percent of poverty whose families do not receive SNAP or other welfare benefits (by public, private);
- number of students whose families receive SNAP benefits (by public, private);

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[2]An ACS direct estimate for a domain—which is defined by geographic area, population group, and time period—is derived using ACS data for that domain only. Data for other domains are not used, as they would be by an indirect, that is, model-based estimator. Although an ACS 5-year period estimate is arguably indirect by this definition, we consider it to be direct for present purposes. Also, we consider estimates to be direct even if models are used to derive weights and obtain variances, as with the ACS.

- number of students whose families receive other welfare benefits (by public, private); and
- number of foster children in school (by public, private).

From these counts, we will estimate the percentage of students eligible for free meals and the percentage eligible for reduced-price meals. We expect that some combination of the last three variables will be used to identify students who are categorically eligible for free meals.

It may be that the best estimates will be the most straightforward: students who are eligible for free meals are those who are categorically eligible (foster children or in families receiving SNAP or other welfare benefits) or have family income no more than 130 percent of poverty, whereas students who are eligible for reduced-price meals are those who are not categorically eligible and have family income greater than 130 percent of poverty and no greater than 185 percent of poverty. For the test districts, we will compare estimates of total and eligible students (by category) from the ACS with estimates from the Common Core of Data (CCD) and Form FNS-742, recognizing that the CCD and the FNS-742 provide estimates for C_T (see Figure 2-1), the distribution of approved students, rather than for E_T, the distribution of eligible students. In addition, the panel will consider the potential effects of errors in both the survey and the administrative data. We will evaluate differences for school districts, in aggregate and by district characteristics, such as level of need.

After the panel has identified leading candidate methods for deriving direct estimates, we will work with the Census Bureau to obtain estimates for all school districts included in the bureau's geographic inventory based on 1-year, 3-year, and (eventually) 5-year ACS data, taking into account the grade range for each district. One-year estimates will be publicly available only for districts with population greater than 65,000 (approximate school enrollment of 11,700).[3] Three-year ACS estimates will be available for all school districts with total population greater than 20,000 (approximate school enrollment of 3,600). At the end of 2010, 5-year estimates will be available for all school districts. Some of these estimates will also be compared with CCD and FNS-742 data. For single-school districts, differences can be evaluated by level of need and for elementary, middle, and high schools.

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[3]The ACS product release schedule is based on total population in the geographic area. The 2006-2008 ACS shows that the nation has about 301,238,000 people, of whom 53,452,000 (about 18 percent) are school-age children in grades K-12. We estimate that in an area with 65,000 people, there will be a school-age population of about 11,700, and in an area with 20,000 people, there will be a school-age population of about 3,600.

POTENTIAL ADJUSTMENTS TO ACS ESTIMATES

In addition to developing one or more basic approaches to deriving direct eligibility estimates from the ACS, the panel will also develop approaches for addressing the challenges discussed earlier. For simplicity, we will call these approaches "adjustments." The challenges for which we will explore adjustments are (1) estimating eligibility from annual rather than monthly income data; (2) accounting for attendance at charter, magnet, and other schools that draw students from neighborhood schools; and (3) enhancing timeliness. Later in the chapter, we discuss methods for improving the precision of estimates and methods for estimating participation.

Monthly Versus Annual Income

The ACS collects data on annual income and annual program benefit receipt. However, eligibility for the school meals programs is based on monthly income and current participation. Several studies have examined the relationship between monthly income and annual income for determining poverty or program eligibility. For example, Naifeh (U.S. Census Bureau, 1998) used 1993 and 1994 Survey of Income and Program Participation (SIPP) data to consider seven different measures of poverty (income relative to the poverty threshold). She showed that, in 1994, the annual poverty rate was 12.6 percent, while the average monthly poverty rate was 15.4 percent. More recently, Newman (U.S. Department of Agriculture, Economic Research Service, 2006b) used SIPP data to show that "an estimated 27% of households that were income eligible for free or reduced price lunches at the beginning of the school year were no longer income eligible for the same level of subsidy by December due to monthly income changes."

A panel of the National Research Council (2003:6-7) considered the problem of measuring eligibility for the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) based on annual income data from the Current Population Survey (CPS). The panel made the following observations:

> The major limitation of the CPS for estimating WIC eligibility is that it measures only annual income and annual participation in WIC and other public assistance programs that confer eligibility for WIC. Use of a monthly measure of income instead of an annual measure, as is currently used, was chosen as the most appropriate time period to measure income to estimate eligibility because WIC regulations give great flexibility in the unit of time for which an applicant must report income and because variation in flows of income for families are better captured with a monthly

income measure. The panel proposes the following new CPS-based option to improve the current CPS estimation.

> . . . [T]o account for monthly income, apply a constant multiplier to the core estimates based on annual income. The panel used Transfer Income Microsimulation (TRIM) data, which simulates monthly income based on the March CPS, to estimate a multiplier for infants and children: 1.2 for infants and 1.05 for children. An alternative to using this TRIM-based multiplier is to use SIPP data to estimate a similar multiplier. The multiplier is used to approximate the incremental effect of using monthly income instead of annual income.

The panel went on to note that SIPP has better measures of monthly income than does the TRIM model, and that if such a multiplier is used, it should be reestimated every few years. The panel recommended that the stability of the multiplier should be continually reassessed.

Table 5-1 displays annual average poverty rates based on monthly income (first row), poverty rates based on annual income (second row), and the ratio of the former to the latter (third row), estimated from SIPP data. The last three rows pertain to children under age 18. Ratios of average monthly to annual poverty rates range from 1.22 to 1.32 for all people and are about 1.22 for children under age 18, indicating that a significantly higher proportion of students may be eligible for free or reduced-price school meals on the basis of monthly rather than annual family income.

The panel will examine similar tables from SIPP for the 130 percent and 185 percent levels of poverty and will also consider estimates by age

TABLE 5-1 Average Monthly and Annual Poverty Rates from SIPP

| Age | Income Measure | Percentage of People with Income Less Than the Poverty Threshold | | | | |
		1993	1994	2001	2002	2003
Total	Average monthly	15.7	15.4	14.1	14.1	13.8
	Annual	12.9	12.6	10.7	10.7	11.0
	Ratio of average monthly/annual	1.22	1.22	1.32	1.32	1.25
Under Age 18	Average monthly	N.A.	N.A.	19.6	19.9	19.6
	Annual	N.A.	N.A.	16.0	16.3	16.2
	Ratio of average monthly/annual	N.A.	N.A.	1.23	1.22	1.21

NOTE: N.A. = not available.
SOURCE: Data for 1993 and 1994 from U.S. Census Bureau (1998). Data from 2001-2003 from U.S. Census Bureau, Survey of Income and Program Participation, Dynamics of Poverty, 2001-2003. See http://www.census.gov/hhes/www/poverty/dynamics01/index.html [accessed May 2010].

or grade. One of the disadvantages of using SIPP to provide data for an adjustment is that the factors can be developed only at the national level or at a relatively high level of geographic aggregation. Based on our examination, the panel will consider whether an adjustment of some kind might improve the accuracy of ACS eligibility estimates.

Charter and Magnet School Attendance

Saporito and Sohoni (2007) note that the income distribution of students attending a neighborhood public school can be affected by students who are drawn away from that school to attend a private, charter, or magnet school. The ACS provides data to estimate eligibility for public and private schools separately. However, the panel is not aware of data on charter and magnet schools, home schooling, open enrollment, or other public school choice programs, except possibly at the school district level. The panel will explore how best to account for the effects of programs that draw children from their neighborhood schools in collaboration with the case study districts. Depending on the availability of local data, some adjustment may be possible.

Timeliness

The ACS 5-year period estimates will present substantial issues of timeliness. When released at the end of 2010, the 5-year estimates for 2005-2009 will represent an averaging of income received during a period starting in January 2004 and ending in December 2009. The midpoint of this interval, January 1, 2007, will be almost 4 years earlier than the release date. Therefore, the impact of an economic downturn with an accompanying increase in eligibility, for example, will be slow to appear in the estimates and then will be averaged over a period of years.

Many statistical programs incorporate adjustments to estimates at one level of aggregation to estimates at a higher level, including the Census Bureau's SAIPE program. Some form of simple ratio adjustment could be used to adjust the most recently available 5-year estimates for school districts to the most recently available 1-year estimates for a higher level, such as the state, county, or metropolitan area. This approach would partially address the timeliness issue faced by direct use of the 5-year estimates. For example, the full impact of broad trends in the economy would be felt an average of 2 years earlier with this hybrid approach than with the direct 5-year period estimates. The approach would not significantly improve the variance of the school district estimates, however, and the improvement in timeliness might come at some cost of accuracy at the school district level. The panel will be able to evaluate the effectiveness of

some approaches for adjustment using the 3-year ACS estimates because three releases of 3-year estimates will be available by the end of 2010. However, there will be only one release of 5-year estimates by 2010, so an evaluation of performance over time will not be possible until well after the panel's work is completed.

The panel will also consider adjusting 5-year estimates from the ACS with other data that reflect the current economic situation, such as administrative data on SNAP participation. Relatively current SNAP participation data are obtained by the Census Bureau at the state and county levels for use in its SAIPE program. Their availability at the local-area level has not been ascertained. For school districts and schools, it is possible that direct certification estimates might provide the most relevant source of data for adjusting direct ACS estimates.[4] However, it is the panel's understanding that direct certification is not currently done for Provision 2 or Provision 3 schools, although it is done in Philadelphia. Hence, the data for such an adjustment would not be readily available, unless districts that adopt Provision 4 are required to continue direct certification.

PRECISION OF ESTIMATES

Direct Estimates

The direct ACS estimates for many school districts and schools are likely to exhibit large standard errors, as illustrated by Table 5-2.[5] For each ACS product (1-year, 3-year, 5-year), the table gives approximate standard errors of the estimated proportion of free and reduced-price eligible students for three different-sized geographic areas. For example, for a school district with 16,000 students and a free and reduced-price eligible fraction of 0.7, the expected standard error for a 1-year ACS estimate is 0.072—so a 90 percent confidence interval would be 0.58 to 0.82.[6] For a school, group of schools, or school district with an enrollment of 1,500 and a free and reduced-price eligibility fraction of 0.7, the standard error for a 5-year estimate is 0.101, and the 90 percent confidence interval would be 0.53 to

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[4]We will also consider whether direct certification information can be used more directly in the derivation of direct estimates by, for example, estimating the number of categorically eligible students from direct certification data and the number of noncategorically eligible students from ACS data. Another potential use of direct certification data is in model-based estimation, as discussed below.

[5]For purposes of this report, we calculated standard errors using the formula for a simple random sample and a design effect of 3. For subsequent analyses, we will perform more refined calculations that reflect the design of the ACS.

[6]The confidence interval is computed as the fraction of free and reduced-price eligible students plus or minus 1.645 times the value in the table.

TABLE 5-2 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 and 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

SOURCE: Estimated by the panel.

0.87.[7] Confidence intervals of 58-82 percent and 53-87 percent of students
eligible for free or reduced-price meals are likely to be too wide for school
districts to evaluate the costs and benefits of implementing a new Provi-
sion 4 for reimbursement of meal costs. The magnitude of the standard
errors in the table and the width of the implied confidence intervals led
the panel to consider model-based estimates to reduce the variation inher-
ent in direct estimates for small areas.

Improving Precision with Small-Domain Estimation Methods

There is a substantial and growing body of statistical literature on
small-domain estimation (e.g., Rao, 2003). Small-domain estimators typi-
cally use auxiliary data and borrow strength across domains to reduce the
sampling variances of the direct estimates. By allowing small increases in
the average bias, it is possible to achieve substantial reductions in vari-
ance, a trade-off making the small-domain estimates an attractive alterna-
tive to direct estimates.

The most relevant example of small-domain estimation for the panel's
work is the SAIPE program, described in Chapter 3. One of the program's

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[7]These are single-release standard errors. To compare estimates from one release to an-
other, the panel will need to account for any correlation between releases.

primary objectives is the estimation of the numbers and proportions of related children ages 5-17 in poverty by state, county, and school district. The estimation process nests estimates at the three levels, controlling the estimates to achieve consistency with the level above. That is, county estimates are controlled to the state estimates, and school district estimates are controlled to the county estimates.

For each state, the SAIPE estimate is a weighted average of a regression estimate and the direct 1-year ACS estimate. The regression estimate uses the ACS proportion of poor school-age children as the dependent variable. Because of their small sampling errors, the direct ACS estimates receive most of the weight in the SAIPE state average.

At the county level, SAIPE also employs a regression model, but the log of the 1-year ACS estimated number of poor school-age children is the dependent variable.[8] Although a composite is formed from the direct ACS estimate and the regression estimate, the regression estimate is the dominant component in the majority of counties.

As noted in Chapter 3, SAIPE distributes the estimated numbers of poor children below the county level to the school district–county pieces within each county according to a shares model based on the number of children in poverty estimated from Internal Revenue Service (IRS) data. Direct ACS estimates at the school district level are not currently employed.

The goals of the panel are sufficiently consistent with some of the goals of the SAIPE program to merit a careful consideration of a "SAIPE-like" approach to the derivation of eligibility estimates for the school meals programs. Therefore, we will establish a mechanism for collaboration with the Census Bureau and other agencies, such as the U.S. Department of Agriculture's Food and Nutrition Service (FNS), for the development and testing of small-domain model-based estimates. Our initial work will focus on the most straightforward adaptations of the SAIPE estimation procedures to produce estimates of students eligible for free meals and students eligible for reduced-price meals at the state, county, and school district levels.[9]

Likely adaptations include the adjustment of the poverty thresholds from 100 percent to 130 percent and 185 percent for the dependent variables in the regression models as well as the independent variables to which such an adjustment would be applicable and operationally feasible. We would also probably investigate expressing the variables in a county

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[8]Although 1-year ACS county estimates are published only for larger counties, the Census Bureau uses the internal ACS data to include almost all counties in fitting the regression model.

[9]The derivation of estimates for individual schools and school groups is discussed in this chapter's next section.

model as proportions rather than log counts, similar to the specification for the state model.

More substantial adaptations can be considered for the derivation of school district estimates, and the panel will consider as many of the adaptations described below as possible given the time frame of the study. As noted above, the current SAIPE method uses a shares model. However, in addition to this approach, we can consider the use of a regression model and the development of composite estimates that combine direct and regression estimates, as in the state and county models. For such a model and, perhaps, for the state and county models, we can investigate the availability and potential predictive contributions of new independent variables constructed from direct certification data or the CCD, for example. One challenge in using a variable that measures the extent of direct certification is that it might reflect not only how much families need assistance from the school meals programs but also how well direct certification is implemented by a school district or a state.[10]

After further consideration of these adaptations, the panel may conclude that some cannot be implemented and adequately evaluated within the schedule and resources available for the panel's work. In that case, we plan to provide recommendations for future research. Additional methodological innovations that will be considered as subjects for future research—if they cannot be thoroughly assessed by this panel—include

- Using 3-year or 5-year estimates rather than 1-year estimates as dependent variables in the regression models to combine the variance-reducing properties of time averaging with the variance-reducing properties of regression modeling.[11]
- Estimating multivariate—multigroup or multiperiod—models. Estimates for free and reduced-price eligible students could be estimated jointly, for example.
- Developing unit-level, rather than area-level, small-domain estimation models. With a unit-level model, the modeling occurs below the target level of estimation, such as modeling at the person or household level to derive estimates for states, counties, or school districts.

In assessing the merits of a SAIPE-like approach, the panel will review the research support for the current SAIPE estimation methods. The SAIPE

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[10]U.S. Department of Agriculture, Food and Nutrition Service (2009) reports that direct certification rates vary substantially from state to state.

[11]Each approach, however, contributes bias, and the interaction of these two sources of bias would pose research questions for which the SAIPE program does not currently provide answers.

program preceded full-scale implementation of the ACS by several years and originally used direct estimates from the CPS. At that time, Census Bureau staff conducted extensive research, and the findings from that research and the estimates of poor related children ages 5-17 that were developed were reviewed by a panel of the National Research Council (2000a). However, the evidence available for evaluating the school district estimates was limited, and there has been no subsequent independent evaluation of the changes to the SAIPE estimation methods, such as the use of ACS data.

In addition to reviewing the findings from evaluations that have already been conducted, the panel will work with the Census Bureau to implement and evaluate the adaptations to current SAIPE methods that are feasible to explore within the time and resources available to the bureau and the panel. We will examine the precision of estimates and assess models for evidence of any systematic lack of fit. Chapter 6 describes in further detail our approach to evaluating estimates.

While the panel will certainly evaluate new methods and estimates according to statistical criteria, such as precision and bias, we will also carefully assess the operational feasibility of any approach when developing our recommendations. Our strategy for determining whether an approach is operationally feasible is outlined in Chapter 7. At this point, however, we note that it will be important to determine that the release of any new estimates does not jeopardize the confidentiality of respondents to the ACS. Currently, SAIPE estimates are made publicly available for all school districts, some of which have only one school. The Census Bureau's disclosure review board made the determination that the few variables released at the school district level for the SAIPE program do not constitute a disclosure risk. The Census Bureau's disclosure review board will need to judge whether this is also the case for estimates of free and reduced-price eligible students prepared as an adaptation to SAIPE.

ESTIMATES FOR SCHOOLS AND GROUPS OF SCHOOLS

Defining Geographic Areas

Our expectation is that estimates for individual schools or groups of schools would be produced only "on demand," that is, at the request of a school district that is considering adoption of Provision 4 but, due to substantial heterogeneity of need across schools in the district, might not adopt Provision 4 district-wide. Because the Census Bureau does not maintain geographic data on school attendance-area boundaries, which can change frequently, a school district would have to provide suitably accurate information on boundaries. However, correct definition of the

school attendance boundaries with respect to census blocks (the building blocks of Census Bureau geography) will be a challenge.[12]

For schools, there are several ways to define their geographic domains. When school attendance areas are defined by school authorities, it may be in the form of a list of addresses, perhaps with ranges (for example, odd numbers in the 100 block of State Street to School A, even numbers to School B). In many respects, address lists have the least potential for error of all of the geographic representations, although there may be errors in geocoding (linking) the addresses to the Census Bureau's Topologically Integrated Geographic Encoding and Referencing (TIGER) database, which is needed to identify the appropriate blocks to aggregate when deriving estimates for schools and groups of schools (see below).

Address lists may be represented in map form, although several problems arise in defining geographic boundaries that are consistent with the address lists. Maps inherently have a variety of errors, including minor projection errors at the local level associated with representing the earth's curved surface with a flat map and more substantive transformation errors associated with digitizing paper maps. Depending on the digitizing process, positional errors associated with digital boundaries can be relatively small or large. Because school attendance areas tend to follow well-defined features, such as streets, it should generally be relatively easy to estimate the positional errors in any set of digitized boundaries.

For the ACS, the geographic support is the Census Bureau's TIGER database, which is a digital map of streets and other features. As noted in Chapter 3, the accuracy of TIGER has been substantially improved through a recent major initiative in preparation for the 2010 decennial census, so positional errors are now in the 5-meter range for streets and other major features. When a positional coordinate (expressed via latitude and longitude) is used to compare school attendance-area boundaries to census data, the positional errors in the attendance-area boundaries are likely to be larger. It will be possible to estimate how large those errors are for the case study districts and to use simple models to determine the impacts of such errors on the estimates that are of primary interest in this study.

Deriving Estimates

Direct estimates of eligible students for schools or groups of schools will probably have to be derived by aggregating and weighting sample counts for blocks. For many schools, however, the attendance boundaries

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[12]In the future, if the School Attendance Boundary Information System project (National Science Foundation, 2009) is successful, it may be easier for school districts and researchers alike to have access to accurate, up-to-date digitized school attendance boundaries.

will run through blocks, and statistical algorithms for splitting blocks may need to be developed and evaluated. Goodchild, Anselin, and Deichmann (1993) describe a framework for areal interpolation—one solution to this problem. 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 meals (available only at the block group level) from the 2000 census. They observed that while census blocks can frequently be located within a school boundary, block groups often cut across school attendance boundaries in unpredictable ways. They made use of an areal interpolation method that assumed that block group rates, such as eligibility rates for free or reduced-price meals, are uniform within block groups that span more than one school attendance boundary.

In another application, FNS commissioned the U.S. Census Bureau to prepare school meals eligibility estimates for school attendance areas in Philadelphia using the 2000 census long-form income data. The work needed to digitize school attendance boundaries for the public schools in Philadelphia was described in their report.[13] In more recent work pertaining to school attendance-area boundaries, researchers on the School Attendance Boundary Information System project (National Science Foundation, 2009) are assigning each ACS block entirely to one school attendance area and are not using any method of interpolation. For the work of this panel, it is unclear which of these approaches will be best in terms of not only accuracy but also feasibility of implementation. The case studies will be used to illuminate this issue.

As an alternative to interpolation, the panel hopes that at least one case study school district will be able to geocode student address lists using TIGER line files and, thereby, provide information indicating how students in each school are distributed across census blocks. This information will shed light on the relative accuracy of different approaches to handling the geography of school attendance areas when developing ACS estimates of students eligible for the school meals programs.

Given that geographic area definitions can be adequately addressed, the challenges in developing estimates for individual schools or groups of schools will be at least as great as, and probably greater than, the challenges in developing estimates for school districts. A direct estimator for a school or group of schools will be less precise than an estimate for the entire district. Furthermore, attendance at a particular school is probably less reliably predicted by a student's geographic residence than is attendance in a district. This problem is particularly severe in districts

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[13]Doug Geverdt, 2005, *Experimenting with School Attendance Area Free Lunch Estimates: A 2000 Census Special Tabulation Case Study*, unpublished report.

with open enrollment or districts where there are many schools, such as charter and magnet schools, that can enroll students from throughout the district without regard to neighborhood school boundaries, and this may introduce errors in estimates for neighborhood schools whose enrollments are substantially affected.[14]

A SAIPE-like estimator could be considered for deriving ACS-based estimates of eligible students for schools and groups of schools. One such estimator is a shares model similar to what is currently used to obtain school district estimates from county estimates.[15] Shares might be developed from enrollment, direct certification, or IRS data (if the IRS data could be tabulated for school attendance areas). An alternative to a shares model is a model with a regression equation (with direct ACS estimates as the dependent variable) and a composite estimator, similar to the current SAIPE state and county models. Independent variables in the regression models could be developed from the same auxiliary data used to estimate shares in the shares models. As described in Chapter 4, the panel will use the case studies to investigate the issues raised here as well as other issues that arise, including errors in digitized school attendance boundaries; the effects of open enrollment or charter, magnet, and other schools; algorithms for splitting blocks; and auxiliary data that can be used in shares or regression models.

ESTIMATING PARTICIPATION

This section describes the challenges associated with understanding the relationship between eligibility and participation and using what is learned to estimate claiming percentages for reimbursement under Provision 4. As shown in Chapter 2, the eligibility and participation distributions are different. According to national estimates for 2009 from the FNS National Data Bank, approximately 40 percent of enrolled students were approved for free meals and 9 percent were approved for reduced-price meals under the National School Lunch Program (NSLP). The remaining 51 percent had to pay full price. In contrast, of the NSLP lunches served on an average day in 2009, 52 percent were served to students approved for free meals, 10 percent were served to students approved for reduced-price meals, and 38 percent were served to students paying full price. These differences between the eligibility and participation distributions

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[14]Home schooling can also draw students from their neighborhood schools.

[15]In SAIPE, direct ACS estimates are used in obtaining model-based estimates for counties, but federal income tax data are used to estimate shares for deriving school district estimates from the county estimates. Direct ACS estimates for school districts are not used by the current SAIPE estimation method.

are attributable to the differences across the eligibility categories in the likelihood of taking a meal—80 percent of students approved for free meals, 72 percent of students approved for reduced-price meals, and 46 percent of students paying full price took NSLP lunches on an average day in 2009 (see Table 2-4).

Understanding Differences in Eligibility and Participation

To better understand the differences between the eligibility and participation distributions, the panel proposes to explore the extent to which the ACS estimates of student eligibility for the schools in the case study school districts differ from the percentages of approved students from the certification process and the participation rates (based on meals served) in those schools. We will also compare data from the schools in the case study districts with the data for these districts in the CCD and the data reported on Form FNS-742. These comparisons will be done by level of need and grade range of school (elementary, middle, and high), attributes that are known to affect participation. Although this will not illuminate how participation might change if all meals were provided at no cost under Provision 4, it will help the panel to understand local differences in the relationship between the eligibility and participation distributions.

The panel will also consider the changes in participation that might be expected under Provision 4 when all enrolled students are given access to free meals. Given typical 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 Provision 4 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 reduces the family's burden of applying for benefits and removes any perceived stigma associated with participating in the program.

There is an additional complication with using the ACS estimates, even if adjusted to reflect participation. The ACS eligibility estimates are estimates of "true" eligibility percentages for all students enrolled at a school. The current claiming percentages under traditional operating procedures, however, reflect participation rates based on numbers of meals served to students as they have been approved through the certification process, which, as noted in Chapter 2, does not assign all students to their true eligibility categories. Not all students, for example, who would be eligible for free or reduced-price meals apply to the program. Currie (2003) finds that for students with income less than 130 percent of poverty, only 87 percent participated in the school lunch program in 1998, while Currie

(2006) cites evidence that participation is higher for the poor than for the nonpoor. In school districts in which a large share of students eligible for free meals do not apply to the program (and are not directly certified), using the ACS eligibility estimates as claiming percentages might increase reimbursements compared with the existing claiming percentages (all other things equal).

The formulas at the beginning of this chapter display the differences in eligibility-based reimbursement (using $\dfrac{E^f}{E}$, $\dfrac{E^r}{E}$, and $\dfrac{E^p}{E}$) and participation-based reimbursement (using C^f, C^r, and C^p). The panel will investigate how to make use of the eligibility estimates from the ACS (E^f, E^r, E^p) along with the participation data described in the remainder of this section to estimate participation (C^f, C^r, C^p).

Sources of Information on Participation

The results from several pilot studies provide potentially useful information on school meals participation. Five states and many school districts have taken advantage of a pilot project to eliminate the reduced-price fee from lunch, breakfast, or both—information about these experiments is presented in a U.S. Government Accountability Office (GAO) report (2009a). The extra cost associated with eliminating reduced-price fees was paid by states or local agencies. The GAO report estimated that there was an average increase in lunch participation of 11 percent among reduced-price-eligible students across all school districts that eliminated reduced-price fees. The minimum percentage increase in reduced-price participation was reported to be 2 percent, and the maximum was reported to be 30 percent. School district officials in these school districts reported that this increase was higher than the increase in the participation rate of free-eligible students (5 percent) and full-price-eligible students (5 percent). (Note that there was no change in the benefits offered to free and full-price-eligible students.) Other potentially relevant pilot studies include the universal breakfast pilot (U.S. Department of Agriculture, Food and Nutrition Service, 2004) and the no-fee school meal pilot (U.S. Government Accountability Office, 1994).

Although the findings from the pilot studies of eliminating reduced-price fees are informative, the panel proposes to develop alternative estimates of the change in participation associated with providing free meals to students approved for reduced-price meals. Specifically, we will use the state-level data from Form FNS-10 to estimate the change in participation for reduced-price-approved students in the five states that have eliminated fees for reduced-price meals compared with any changes in participation that have occurred in the other states. For this analysis, we

TABLE 5-3 Projected Percentage Increase in Student Participation from Traditional to Free Meals for Students in the National School Lunch Program

Elementary School Pre-K Through 5th Grade		Middle/Junior High 6th Through 8th Grade		High School 9th Through 12th Grade	
Current Participation	Projected % Increase	Current Participation	Projected % Increase	Current Participation	Projected % Increase
60-70	3	45-55	22	30-40	33
70-80	4	55-65	15	40-50	25
80-90	2	65-75	13	50-60	15
90-95	1	75-85	8	60-70	10
		85-95	3	70-80	5

NOTE: Participation = average daily number of meals served divided by total enrollment.
SOURCE: Texas Department of Agriculture (2009).

will use the state-level FNS-10 data on number of meals as the dependent variable and a dummy variable for when (whether) the state has implemented a program eliminating the reduced-price category as the treatment indicator in a regression specification.

In addition to this analysis, the panel will examine estimates developed by the state of Texas for districts considering whether to adopt Provision 2. The estimates, which are displayed in Table 5-3, give the percentage increases in participation expected for districts adopting Provision 2. Using the table and a companion worksheet (section 5.13 of the referenced document), a school can project the increase in participation (total number of meals served per day) that it might experience. The table was developed from average daily participation data for school districts that adopted Provision 2 in Texas. The percentage increases were computed by comparing meal counts in the 2 years before adoption of Provision 2 with meals counts in the 2 years after adoption of Provision 2 separately for elementary, middle, and high schools at various levels of initial participation (average daily number of lunches served divided by total enrollment). The analysis was first conducted in the mid-1990s and has been regularly updated.

To shed additional light on the potential effects of Provision 2 on participation, the panel plans to collect data concerning changes in participation experienced by existing Provision 2 schools when they first began operations under Provision 2.[16] In the year before the first base year, a

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[16]Provision 2 is the only one of the current provisions that yields the data to illuminate changes in participation by category. Under Provision 3, schools do not provide free meals to all students during the base year.

school would have taken applications and counted meals according to the traditional approach. In the base year, the school would have taken applications, provided all meals for free, and counted meals by approval category. In addition to identifying the base year for each school adopting Provision 2, data to be collected include the number of students approved by category, the average daily number of meals served by category, and the total number of meals served, all as of October for each year. Along with data from selected schools that did not operate under Provision 2 (as controls), we can estimate the overall increase in participation due to the adoption of Provision 2 and the increase in participation by category.

Schools and school districts that are not on Provision 2 or Provision 3 are required to retain information on the number of students approved by category and average daily number of meals served by category for only 3 years,[17] while those on Provision 2 need to retain their base year claiming percentage information as well as the current year number of total meals for which reimbursements were made. Thus, the panel will need to identify Provision 2 schools that began operating under Provision 2 within the most recent 2 or 4 years (depending on data availability), so that the participation and eligibility data are likely to be available for the base year and for at least one year immediately preceding the base year. Ideally, for each such Provision 2 school, a nearby similar school can be identified and the same data elements collected. This second school will be a "control" to help account for changes in participation that may be due to local conditions.

With data identifying the Provision 2 schools, their first base year, and how many meals were served by year by category, a regression equation can be used to predict the effect of universal free meals on participation. An example of such a regression equation is

$$L_{ijt} / N_{ijt} = B^0 + B^1 T_t A_{ij} + B^2 A_{ij} + B^{3j} D_{it} G_j + B^4 Z_{it} + error_{it}$$

where

- L_{ijt} is the number of meals served in school i in category j (free, reduced price, full price) in time period t;
- N_{ijt} is the number of students in school i in category j in time period t (note that N_{ijt} and L_{ijt} will not be defined for Provision 2 districts after the base year);
- T_t is an indicator for time period t;
- A_{ij} is an indicator for school i category j;
- G_j is an indicator for being in category j;

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[17]Some states require that data be kept for 5 years.

- D_{it} is an indicator variable for the base year of a Provision 2 school (first year of free meals); and
- Z_i is other school characteristics, possibly including grade range (elementary, middle, or high), the ACS-estimated eligibility shares, and perhaps other school-level controls from the CCD.

The number of students estimated in the population will be used as weights to yield estimates of participation that are representative of the population. Then, the estimated coefficient for B^3 is the estimated effect of providing free meals per student in category t. We will also explore specifications with the overall number of meals divided by enrollment as a dependent variable, controlling for each time period's claiming percentages. Depending on data availability, the model may be adapted to include information from Provision 2 schools after the first base year when only total number of meals served is available.

The panel is exploring several approaches to identify and recruit school districts or states to provide data:

- The School Nutrition Association (SNA) has developed a profile of participants at their 2010 School Nutrition Association Legislative Action Conference. The profile includes information about the school district and whether it has Provision 2 schools. SNA has agreed to provide the panel access to this profile, so that we can conduct a voluntary survey of districts that appear especially relevant to this study.
- The states in which the case study school districts are located will be asked to help locate Provision 2 schools that have adopted Provision 2 recently. In these states, the case study school districts may serve as "control" school districts.
- Form FNS-742 obtains data by school district on the number of schools and students in Provision 2 and Provision 3 schools not in a base year. It also has information on the number of students approved for free and reduced-price meals. These data could be used to profile Provision 2 and Provision 3 participation by state to identify states to target should additional data be needed.

The panel plans to conduct structured open-ended interviews with state and school district officials. Questions will be asked about Provision 2, about meal costs and revenue, and whether the school district officials would be willing to work with the panel in the future. The panel would also like to get a sense of factors that the districts think will be important when determining whether to adopt Provision 4. In addition

to collecting information to analyze changes in participation, the panel expects to obtain information to analyze costs.

ASSESSING COSTS AND BENEFITS

Once we have some sense of the possible changes in reimbursements due to adoption of Provision 4, it remains to estimate the effects on costs and benefits. Our assessment will be primarily in terms of costs and revenues, although we recognize that a chief benefit, which is crucially important but hard to quantify, is that of expanding the school meals programs to reach more students and thereby improve their nutrition and readiness for learning. The financial impact for school districts will depend on the balance between the increased costs of providing more meals, on one hand, and the increase in reimbursements from higher participation, together with the savings from reduced administrative costs of certification, verification, and meal counting by category, on the other hand.

We will draw on previous work on program costs, including U.S. Department of Agriculture, Food and Nutrition Service (2004) on the School Breakfast Pilot Project; U.S. Department of Agriculture, Food and Nutrition Service (1994b, 2008a) on the School Lunch and Breakfast Cost Studies, I and II; U.S. Government Accountability Office (2002) on the costs of three administrative processes; and U.S. Department of Agriculture, Food and Nutrition Service (2007b), which is the Access, Participation, Eligibility, and Certification (APEC) report. The GAO study, for example, estimated costs for (1) providing, accepting, and reviewing applications for free and reduced-price meals; (2) verifying eligibility for free and reduced-price meals; and (3) counting reimbursable meals and claiming federal reimbursement. Data were collected in five states for two districts in each state and two schools in each district.

As discussed earlier in this chapter and in Chapter 4, we will also be collecting cost and revenue information via structured interviews and data requests from the case study school districts, volunteers identified via the SNA survey, and possibly other states or school districts. With all of the available information, we will estimate the savings from eliminating certification, verification, and meal counting by category. For the case study districts, we will use estimates of eligibility and participation as the basis for hypothetical claiming percentages for reimbursement under Provision 4. The implied hypothetical reimbursements will be assessed relative to reimbursements under the traditional approach (which the case study school districts are using now). Then, differences between costs and reimbursements will be compared for the traditional approach and Provision 4 to identify situations that render Provision 4 more or less attractive to school districts.

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Evaluation of Estimates

By eliminating the need to collect applications, conduct verifications, and assess the eligibility status of students taking meals, a new Provision 4 would ease administrative burden in exchange for providing free meals to all students. Even schools operating under Provision 2 or Provision 3 might find Provision 4 attractive because it eliminates the "base-year" requirements to collect applications, conduct verifications, and count meals served by category. Reimbursements under Provision 4 would be based on claiming percentages estimated from the American Community Survey (ACS) in combination with data from other sources and information on participation as described in Chapter 5.

This chapter focuses on the suitability of such estimates from the perspective of their fitness for use. The panel will examine their quality from three perspectives: (1) by exploring sources of possible discrepancies between the estimated claiming percentages and the concept behind the authorizing legislation and regulations of the school meals programs, (2) by evaluating the quality of the estimates in the context of the error associated with existing practices and provisions, and (3) by assessing the estimates in the context of the decision processes to be affected by the estimates. In taking this approach, we recognize that no system for determining claiming percentages is perfect. We seek to identify the best method possible, not only from an error perspective, but also from the viewpoint of reducing costs and burden associated with administering the school meals programs and of improving access to the programs by the nation's school children relative to current practices.

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The quality of an estimate has many determinants, including the data sources that are inputs to the estimate and the underlying models used to generate the estimate. Survey estimates, for example, are subject to errors that arise in the survey process of sampling a population, obtaining data from the sampled households, and processing the collected data to create an analysis data set. Errors in administrative databases arise from the fact that most of these databases were not created to be analyzed as a whole, but rather to manage individual cases. Attention has seldom been given to editing the data in a unified way, so there may be many 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 will involve identifying which records in a survey or administrative database are associated with the school district or school based on some geographic domain, and this will also be subject to error. Finally, when estimates for small populations, such as small school districts or individual schools, are needed, the estimation method will almost certainly involve some form of statistical model that specifies a structure to approximate—with error—the observed relationships in the population.

While this list may seem extensive, the current procedures for certification and meal counting in the school meals program, for example, are subject to their own errors associated with administrative processes that involve parents, students, lunch room staff, and office staff. The Access, Participation, Eligibility, and Certification (APEC) study (U.S. Department of Agriculture, Food and Nutrition Service, 2007b) has shown that the error rates and costs associated with these processes can be large. Thus, it is our intent to identify a method for implementing a new special provision that improves on the current approach in a cost-effective manner.

The chapter next describes the policy and decision-making context in which Provision 4 will be considered and summarizes the challenges associated with the current approaches to determining the proper reimbursements to school districts. The remainder of the chapter discusses various dimensions of quality that will be considered and outlines proposed approaches for evaluating the quality of the potential methods for estimating claiming percentages for Provision 4.

POLICY AND DECISION-MAKING CONTEXT

To promote improved learning and nutrition among school-age children, the National School Lunch Program (NSLP) and the School Breakfast Program (SBP) provide free and reduced-price meals to needy children. Under the traditional rules and procedures for operating the school meals programs, school districts serve as local administrators of the program

by determining the eligibility status of students (free, reduced price, full price), devising menu plans to meet the nutritional requirements set by the federal government, serving meals, and collecting money from students expected to contribute to the cost of the meals. The federal government reimburses states for the subsidized cost of meals, and states reimburse school districts. It is in the interest of all parties that the mechanism by which the schools are reimbursed is both accurate and predictable. From the national perspective, accurate and predictable reimbursements provide incentives for schools to foster program access and meet the nutritional needs of children while providing adequate oversight to control the program's overall budget. Local schools desire accurate and predictable reimbursements to protect local resources from being inadvertently diverted from other educational priorities to the school meals programs.

What is meant by an accurate and predictable reimbursement to a school district? Federal legislation requires that for every meal meeting nutritional requirements, the district shall receive an amount of reimbursement based on the eligibility status of the student to whom the meal was served. In school year 2009-2010, the district receives $2.68, $2.28, and $0.25 for lunches served to students approved for free, reduced-price, and full-price meals, respectively. Schools that served more than 60 percent free and reduced-price lunches during 2007-2008 are eligible for 2 cents more per category.[1]

In the traditional approach, the accuracy of the reimbursement depends on five factors:

1. the correct certification of students as approved for free or reduced-price meals,
2. the ability of the cashier to determine whether a student's meal meets the federal nutrition requirements,
3. the correct classification of each student taking a meal by approval category (free, reduced price, or full price),
4. the counting of meals served to students by their approval status, and
5. the transmission of the school's determinations to the school district and state to the federal government for reimbursement.

Under Provision 4, reimbursement would be based on claiming percentages estimated from the ACS and total meal counts that involve Factors 2, 4, and 5.[2] Hence, the errors that will be eliminated with Provi-

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[1]Additional details on nutritional requirements of meals and reimbursements are provided in Chapter 2.

[2]For Factor 4, errors in counting the total number of meals served will remain, but any errors in counting the number of meals by category will be eliminated.

sion 4 will be those related to application, certification, and verification (Factor 1), those associated with identifying the eligibility category of a student who is being served a meal (Factor 3), and those associated with counting meals by category (part of Factor 4).

As discussed in Chapter 5 and later in this chapter, however, the distribution of eligible students (distribution E in Figure 2-1) will be estimated with error using the ACS and other data. Furthermore, because Provision 4 requires no meal counting by category of eligibility, the distribution of meals served (distribution M_U in Figure 2-1) will not be measured for the schools operating under Provision 4. The relationship between eligibility and meal participation by category will need to be estimated using the methods discussed in Chapter 5. These methods rely on observational data from districts that are not from a nationally representative sample, which may affect the accuracy of reimbursement based on the estimated claiming percentages. The panel will consider these issues as it carries out its analysis.

Although the panel will identify potential sources of error in estimates that may lead to errors in the reimbursements the school should be receiving, it is important to recognize that the correct amount of reimbursement will never be known. However, it is desirable that the level of error and uncertainty surrounding estimates used for reimbursement be limited to acceptable levels. Therefore, the panel will seek to develop methods that improve on the consistency and accuracy of the traditional method for determining reimbursements.

For management and planning purposes at both the local and the federal levels, it is desirable to minimize the level of intertemporal variation in the reimbursements due to random fluctuations in annual estimates that are unrelated to real changes in conditions. This is not to imply that reimbursements should remain constant over time. On the contrary, the variation in reimbursements over time should reflect changes in the correct reimbursements owed to the school as a result, for example, of an economic downturn (or boom) that results in more (or fewer) students being eligible for free and reduced-priced meals.

ERRORS IN CURRENT METHODS TO DETERMINE REIMBURSEMENTS

Traditional Method

While the panel will focus on evaluating the accuracy and reliability of a new method (Provision 4) to determine reimbursements, it is important to place this evaluation in the context of errors associated with the procedures in use today. 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 to the school meals programs by supplying their income and the number of household members or the information required to established categorical eligibility (e.g., a Supplemental Nutrition Assistance Program [SNAP] case number).[3]

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 an eligible family does not apply and is not identified by direct certification, a needy student has been denied access to free or reduced-price meals to which she or he is entitled.[4]

Even if parents submit the application form for their children, they must correctly complete it. This requires that parents have a correct understanding of the program definitions of income and membership in the household. For example, when parents are asked to report the number of household members, they need to know that foster children living in their household should not be counted, but that relatives such as aunts or grandparents should be counted. Parents need to know which forms of income should and should not be included. The application process further requires that parents accurately apply these concepts to their individual family situation.

After an application is submitted, school or district officials must review the application and determine whether the student is eligible for free meals or reduced-price meals (or has to 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 might reduce errors in the completion and review of applications, substantial certification errors still remain, as discussed below.

Once a student is approved for a specific eligibility status (free, reduced price, or full price), the school must retain daily records of the number of meals served for each eligibility status by linking a meal served to a student and then linking that student to his or her certified eligibility status. The daily records are compiled and then submitted to the school district. The school district submits them to the state. The state completes Form FNS-10, providing the information the Food and Nutrition Service (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) described in Chapter 2 was an effort by FNS to obtain

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[3]An application does not need to be submitted if a student has been directly certified for free meals. Chapter 2 provides details about direct certification.
[4]This is not counted as a certification error in official statistics, however.

national estimates of the amounts and rates of erroneous payments in the NSLP and the SBP. The APEC study found that the certification process is especially prone to error, with approximately 9 percent of total reimbursements for both the NSLP and the SBP considered erroneous due to 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 error. (The two sources of error could occur on the same application and may have been offsetting.) Administrative error led to overcertification for 6.2 percent of applications and undercertification for 2.1 percent of applications, while household reporting error led to overcertification for 13.5 percent of applications and undercertification for 9.7 percent of applications.[5] The most common type of household reporting error was misreporting of total income. This error affected 20 percent of certified or denied students. And 8 percent of certified or denied students had errors in the number of household members listed on the form. The most common administrative error was certification of the student as eligible for free or reduced-price meals when the application was incomplete.

According to the APEC study (U.S. Department of Agriculture, Food and Nutrition Service, 2007b:vol. 1, p. 53), 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). At the other end of the distribution, 36 percent of the students whose applications were denied, and thus were deemed as full-price students, should have been approved as free or reduced price (19 and 17 percent, respectively). Given the limited range of incomes for which a student would qualify for reduced-price meals, students who were approved with reduced-price status had the greatest amount of error. Roughly one-third of the approved reduced-price students should have been approved as free, and 25 percent should have been approved as full price.

The APEC study demonstrates the level of error in the traditional approach. It also demonstrates that the net effect of certification error tends to result in overreimbursement to districts, as illustrated next.

To quantify the effect that certification errors can have on the distribution of students by eligibility status when using the traditional method, the APEC study compared the distribution of students based on the categories for which they had been approved with the distribution based

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[5]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.

on their true eligibility status, using the sample of students who went through the certification process and either had been certified for free or reduced-price meals or had their applications denied. 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). 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, 2007b:53).

The impact of certification errors on the amount of reimbursement is reflected in what can be called a "blended reimbursement rate," or the average reimbursement per meal served (recall that a district is reimbursed $2.68, $2.28, and $0.25 for a meal served to a free, reduced-price, and full-price student, respectively). The blended rate (for those students who go through the certification process) based on the distribution of true eligibility status is $2.33, but it is $2.49 when based on the distribution of students as approved by the certification process—a 16 cent per meal difference.[6]

For the purpose of reimbursements, however, the relevant distribution is of meals served by category, not the distribution of students by category. As shown in Table 2-4, the fiscal year 2009 participation rates— meals served divided by the number of approved students adjusted for absenteeism—were 80, 72, and 46 percent for the free, reduced-price, and full-price categories, respectively. If we assume that the participation rate is based solely on the approval status and if eligibility has been correctly assessed, the blended rate for students going though the certification process and taking participation into account would be $2.45 per meal. Based on the approval status determined by the certification process, the blended rate for students going through the certification process and taking participation into account is $2.55.[7]

The APEC study also evaluated noncertification errors, classified as cashier error or aggregation error. 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. However, most schools had fairly low levels of cashier error. The high

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[6]The blended rates above exclude the 25 cents per meal reimbursed for participants from the full-price category whose families did not submit an application and were not directly certified, but the amount reimbursed for this group is the same regardless of the classification of the other students. Hence the difference, 16 cents per meal, accurately reflects the impact of incorrect classification on reimbursement. It does not address the fact that some of the full-price students may have been eligible for a free or reduced-price meal.

[7]The smaller implied overpayment based on the distributions of meals served rather than the distributions of students arises because participation rates are much lower for students paying full price than for students approved for free or reduced-price meals.

aggregate levels of cashier error arose from a few large schools having very high levels of this type of noncertification error. The study did not quantify cashier error due to Factor 3, incorrectly identifying the approval category of a student taking a reimbursable meal. However, it was hypothesized that automated point of sale technology in place in most schools would minimize this type of error.

Provision 2

From the perspective of expanding program access and providing nutritional meals to students, the adoption of Provision 2 by a district is clearly beneficial. Since the certification process no longer affects what the students will pay for their meals, participation in the program should increase. Students who truly were needy but were misclassified as full-price students will no longer have to pay for meals. The cost of this approach is that students who should be asked to pay will no longer be required to do so. This cost will fall on the school districts.

In general, the sources of error in reimbursements noted for the traditional method will also apply to Provision 2. Given that the claiming percentages remain fixed over a 3-year period, claims for reimbursement under Provision 2 will not reflect changes in income or demographics that would be reflected in the traditional method, which creates an additional source of error. Provision 2 reimbursements rely on less frequent use of application and certification procedures than under the traditional method—only once every 4 years. Infrequent certification may result in less accurate estimates of the claiming percentages, since parents may be less likely to return the application forms, and, even if they do, their responses may be less accurate due to their lack of familiarity with the forms. In addition, office staff may no longer be as skilled in performing the certification process, which may add another source of error. For these reasons, the accuracy of estimated claiming percentages might worsen when applications and certifications are done only once every 4 years.

The APEC study found evidence of this. It observed that erroneous payments due to certification error are more common in Provision 2 or Provision 3 schools (in their base years) than in schools not using these provisions (erroneous payments were approximately 1.75 percent larger for the Provision 2 or Provision 3 schools for the NSLP). A large proportion of students certified for free meals in the base year of Provision 2 or Provision 3 schools were overcertified. Hence, the claiming percentages for free or reduced-price meals tend to be overstated. The significance of the finding is that because the claiming percentages in these schools are fixed for at least 3 years, the Department of Agriculture has no mecha-

nism for correcting the erroneous claiming percentages unless the schools reestablish them in a new base year.

Provision 3

Federal reimbursement under Provision 3 is based on estimating the number of meals served in a category as the product of the number of meals served in that category during the same month in the base year times a factor that reflects changes in enrollment, the number of operating days, and inflation. Errors associated with certification during the base year for Provision 3 schools are as described under the traditional method and Provision 2 above.

One feature of Provision 3 is that schools do not have to count the number of qualified meals served each day. If the number of meals served by category remains unchanged (so that the participation rates of students remains unchanged), Provision 3 and Provision 2 reimbursements should be the same, but Provision 3 relieves the school of determining the daily count of meals served and thereby lowers the school's administrative costs. However, any change in participation when enrollment stays steady would result in erroneous payments.

POTENTIAL ERRORS IN PROPOSED DATA SOURCES AND ESTIMATION METHODS

The primary data source for estimating eligibility percentages under Provision 4 is the ACS. Estimates from other national surveys, such as the Survey of Income Program Participation (SIPP), may also be employed to adjust ACS-based estimates for systematic bias. Although we focus on the ACS, the discussion applies to most national surveys more broadly.

Probability surveys 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 meals, the most problematic error components for the ACS are likely to be sampling error, specification

error, and measurement error. Although we will consider other sources of error in our evaluation, the ACS has a relatively high coverage rate and response rate, and processing errors in an ongoing survey tend to be small due to the repeated use of systems developed for the survey.

Sampling Error

In the context of a probability sample, sampling error is the error from observing only a portion of the population rather than the entire population. It recognizes that an estimated percentage (or other parameter estimate) calculated from the sample responses is very unlikely to be the true percentage associated with the population. Metrics of sampling error provide a measure of how much an estimate would vary if the sample were redrawn under the same design and the survey conducted in exactly the same way. Sampling error is typically quantified via the standard error of the estimate or related measures, such as a confidence interval or margin of error. The sampling error is a function of the underlying sample design and the population variability of the characteristic used to calculate the estimate. Sample designs are typically configured to obtain the most precise estimates of specific domains given cost and operational constraints.

When estimates of small domains—geographic areas or population groups—are of interest, sample sizes are generally small and sampling error is correspondingly large. For this study, it is likely that the reliability of direct estimates of the fraction of students eligible in each school meals category for individual schools, and even some entire school districts, will not be acceptable. In this situation, it is common, as discussed in Chapter 5, to use a model-based or model-assisted estimation approach that uses auxiliary data and modeled relationships to improve the precision of estimates for the small domains. A potential issue is the bias that can occur if the model approximation is incorrect. Methods to evaluate lack of fit can be used to assess this issue. As noted in Chapter 5, the Small Area Income and Poverty Estimates program has experience in developing estimates of the percentage of children in families with income less than 100 percent of poverty, and one way to mitigate the effect of small sample sizes is to extend these models to provide estimates of children in households with incomes under 130 percent and between 130 and 185 percent of the poverty level.

Specification and Measurement Error

When conducting a survey, one is generally interested in collecting data on a specific concept, even if one cannot always directly observe the

concept. Specification error arises when the question or measurement method does not match the target concept. In our application, we will interpret specification error somewhat differently. That is, we will look at specific questions in the ACS with respect to the concepts associated with school meals eligibility criteria (e.g., income, reporting unit), rather than the original target concept that the survey question was designed to measure. 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 income in accordance with the question's definition; or provide erroneous answers due to social desirability pressures, perceived stigma, or privacy concerns in answering sensitive questions, such as questions about income and program participation.

In considering specification and measurement errors, the panel will focus on variables used to estimate eligibility: income, relationships within the household, program participation (SNAP, other welfare assistance), school status, grade, and age. For the ACS, the annual income measure appears to be comparable to the Current Population Survey measure used to determine official poverty rates (Czajka and Denmead, 2008). However, the annual figure averages over monthly income fluctuations and, as noted in Chapter 5, 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). Moreover, relative to program eligibility criteria, 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 has a question that obtains information on SNAP participation during the past year, cash and other welfare assistance programs 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.[8] Finally, the geographic detail needed for some objectives in this study may require estimates based on the 5-year ACS, and thus will be insensitive to recent changes in the economy. As noted in Chapter 5, these issues suggest

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[8]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, 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.

that adjustment factors may be needed to reduce the potential for bias in ACS eligibility estimates.

In addition to the factors noted above, the accuracy of survey estimates for small geographic areas depends on how well the geographic definition of the areas (school attendance boundaries) corresponds to the geographic areas in the survey (census blocks or block groups). The panel will use the school attendance areas in the case study districts to assess potential errors in digitized boundaries and use simple models to determine the impacts of such errors on the estimates that are of primary interest in this study.

PROPOSED EVALUATION PLAN

The previous sections have raised several potential issues associated with the inputs to estimates or the estimates themselves and the contextual backdrop against which we will assess these sources of error. We expect some error components to be quantifiable from the basic principles of statistics applied to the data sources or estimators themselves, while others will require further information gathering and analyses in order to evaluate assumptions and potential errors. It is possible that some aspects of the potential error in estimates will not be resolvable within the constraints of this study, and further studies may be suggested.

We anticipate using the following tools to describe the quality of estimates for Provision 4 and the potential impact of major issues on the accuracy of the estimates themselves, the costs and efficacy of operating the school meals programs under Provision 4 (relative to the traditional approach), and on decisions that are made by policy makers and program administrators.

First, we will analyze the results of the estimation processes outlined in Chapter 5 and the potential impact of errors in the data sources on the estimates. This will include not only an evaluation of sampling error, but also, to the extent possible, an evaluation of the potential biases that may exist in the estimates relative to errors in the current methods under traditional operating procedures.

Second, we will use the six proposed case study school districts to obtain information for estimating error in the context of existing practices. For example, we will examine and measure the uncertainties introduced at the school district and school attendance-area levels by boundary mapping and translate these into potential uncertainties regarding estimates. We will also use data from the schools in the case study school districts to assess the potential magnitude of discrepancies between reimbursements based on ACS-based claiming percentages under Provision 4 and

reimbursements based on current data and methods under traditional procedures, which the case study districts are now using.

Third, we will conduct a workshop with school district representatives to gain a better understanding of the issues of interest to schools and school districts relative to Provision 4. We will encourage school district representatives to discuss potential errors and costs associated with both the current approaches and Provision 4. Case study district representatives will be key participants in the workshop.

Fourth, where direct information is not available, we will attempt to perform calculations to identify theoretical minima and maxima for potential errors and construct simulations to identify specific conditions that are more likely to be sensitive to errors and to determine the range of possible errors under these conditions relative to the uncertainties that exist in current methods.

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Operational Feasibility

Previous chapters have described the technical details of the work to be done by the panel to develop methods using American Community Survey (ACS) and other data for estimating claiming percentages for reimbursement by the U.S. Department of Agriculture (USDA) for universally free school meals served under a new Provision 4. This chapter describes the panel's approach in making sure the proposed methods can be implemented in practice. It comments on agreements and reviews needed at various steps of the estimation process to ensure operational feasibility. It describes these steps in terms of the two main factors that influence feasibility: (1) geographic detail of estimates (school district versus individual school or group of schools) and (2) ACS direct estimates versus model-based estimates.

An additional complexity is introduced by the adjustments discussed in Chapter 5, not only those needed to better reflect eligibility criteria, enhance timeliness, and capture the impact of charter and magnet schools,[1] but also those needed to reflect students' participation and the meals that will be served under Provision 4. Details associated with these adjustments and the data needed to make them are as yet not fully specified. Information provided by the case study districts, the Census Bureau, and the Food and Nutrition Service (FNS) will help the panel develop recommendations for how adjustments can best and most easily be imple-

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[1]Open enrollment, school choice programs, and home schooling can also draw students from their local schools.

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mented. The approaches discussed below will require one or more inter-agency agreements between the Census Bureau and FNS that will address schedules for activities, resources that will be devoted to those activities, data use restrictions, and other issues ultimately determining whether recommended methods and procedures are operationally feasible.

ESTIMATES FOR SCHOOL DISTRICTS

As noted in Chapter 3, the Census Bureau maintains up-to-date school district boundary information and already provides special tabulations of the ACS for school districts. Furthermore, it provides estimates from its Small Area Income and Poverty Estimates (SAIPE) Program for all school districts included in its geographical database. Hence, it should be relatively straightforward for the Census Bureau to prepare estimates for school districts according to specifications from the panel.

ACS Direct Estimates

The direct ACS-based estimates of eligibility described in Chapter 5, possibly with the indicated adjustments, are similar to data products already produced by the Census Bureau. These estimates would be based on 1-year, 3-year, and (eventually) 5-year ACS data. As noted in Chapter 5, 1-year ACS estimates will be publicly available only for school districts with a population greater than 65,000 (approximate school enrollment of 11,700). Three-year ACS estimates will be available for all school districts with a total population greater than 20,000 (approximate school enrollment of 3,600). Beginning in late 2010, 5-year estimates will be available for all school districts.

Model-Based Estimates

The panel's work aims to result in model-based estimates of eligibility that are of sufficient accuracy to be considered for use in developing claiming percentages for determining reimbursements under Provision 4. The current SAIPE process, on which the panel's work will be based, produces model-based estimates of poor school-age children that are publicly released for all school districts in the country. Should FNS decide that model-based estimates of eligibility could be used in developing claiming percentages for determining reimbursements to school districts under Provision 4, an interagency agreement with the Census Bureau would be needed for regularly providing estimates for the multiples of the poverty thresholds that are used for free and reduced-price school meals. Work would be needed by the Census Bureau to incorporate the panel's meth-

odology, potentially including adjustments, into a production system for acquiring and preparing data and deriving estimates. Model-based estimates would need to be reviewed by the Census Bureau's disclosure review board to make sure public release would not jeopardize the confidentiality of ACS respondents. Should such an approach be feasible, with no confidentiality concerns, estimates would be publicly available for all school districts.

ESTIMATES FOR SCHOOLS OR GROUPS OF SCHOOLS

The challenge associated with providing estimates for schools or groups of schools in districts for which Provision 4 would not be adopted for the entire district for financial or other reasons is that the Census Bureau does not maintain boundary information at this level of geographic detail. Hence, the panel will need to propose a process, most likely an annual process, by which school districts provide to the Census Bureau school attendance-area boundary information and possibly auxiliary information, such as counts of students directly certified, and the Census Bureau provides to the districts ACS direct or model-based estimates using the methods developed by the panel. Among the issues that are not yet clear are the cost to school districts and how geographic issues (such as split blocks) could be resolved. These details will be considered by the panel with input from the Census Bureau, FNS, and the case study districts. Another issue that is not yet clear is how many school districts might participate in the process with the Census Bureau. Based on the simple tabulations presented in Chapter 4, it is likely to be a minority—perhaps a small minority—of districts.

ACS Direct Estimates

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 and block groups 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 or for groups of schools would be based on 1-year, 3-year, or 5-year ACS data, depending on the population size 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. Other details that would need to be worked out include how the adjustments described in Chapter 5 would be incorporated into the estimates.

Model-Based Estimates

Obtaining model-based estimates for schools or groups of schools would also require accurate digitized school attendance-area boundaries or lists of the census blocks and block groups associated with school attendance areas. As the panel works through the development of model-based approaches, it will need to specify procedures for producing estimates for school attendance areas only for districts that request such estimates. This need will affect the details associated with how estimates are derived, as this is different from the current SAIPE process that produces estimates for the entire universe of areas at each geographic level (states, counties, and school districts).

Once the details of the estimation methodology have been worked out, the Census Bureau would need to incorporate the panel's methodology into a production system. The bureau's disclosure review board would need to review school-level estimates. However, the current SAIPE process produces estimates for some small districts that have only a single school, so incorporating estimates for selected additional school attendance areas should not significantly change the risk of disclosure.

The panel will need to work with the Census Bureau to determine whether it would be efficient to add school attendance-area estimates to the school district-level product described above. If not, the panel will need to develop details of other approaches with input from FNS and the Census Bureau. The panel looks forward to working with the case study school districts, FNS, and the Census Bureau to determine methods that are operationally feasible for producing estimates that could be considered in a new Provision 4 to expand the reach of the school meals programs and minimize administrative burden for schools and families.

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Appendix A

Glossary

This glossary provides definitions of terms used in the school meals programs. The panel determined which terms to include based on their experience in preparing this report.

Application   Local education agencies provide a letter to parents of students 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 and, within 10 working days of receiving an application, make a determination about 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 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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Categorically eligible | Eligibility arising from a student's family participation in means-tested programs, such as the Supplemental Nutrition Assistance Program (formerly the Food Stamp Program), Temporary Assistance to Needy Families, or Food Distribution Program on Indian Reservations. A student is also 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 education liaison.

Certification | The process of determining which enrolled students are eligible for the school meals programs. There are two subprocesses: (1) direct certification, and (2) application.

Direct certification | The process by which local education agencies identify "categorically eligible" students primarily based on their participation in the Supplemental Nutrition Assistance Program (SNAP), Temporary Assistance to Needy Families (TANF), or the Food Distribution Program on Indian Reservations. The 2004 Child Nutrition and WIC Reauthorization Act requires 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 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, etc.) 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.

Eligible | Students are eligible for free school meals if their family's "current" monthly income is no greater than 130 percent of the poverty guideline or if they are categorically 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."[1] Students are eligible for reduced-price meals if their family's current income is greater than 130 percent of poverty but no greater than 185 percent of poverty. All other students are eligible for full-price meals.

Local education agency	Local education agency is 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 a 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, 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.
Meal counts	The total number of meals served that satisfy nutritional requirements of the school meals programs by eligibility category (free, reduced price, and full price). Cashiers determine whether a student's meal qualifies under the school meals program and whether each child is eligible for a free, reduced-price, or full-price meal. This process provides the meal counts maintained in school records that are used to determine federal reimbursements in the school meals programs.
Nutritional standards	School lunches and breakfasts must meet the applicable recommendations of the 1995 Dietary Guidelines for Americans, which recommend that no more than 30 percent of an individual's calories come from fat and less than 10 percent come from saturated fat. Regulations also establish a standard for school lunches and school breakfasts to provide one-third and one-fourth, respectively, of the recommended dietary reference intakes (formerly

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[1] *Eligibility Manual for School Meals: Federal Policy for Determining and Verifying Eligibility*, see http://www.fns.usda.gov/cnd/Governance/notices/iegs/EligibilityManual.pdf [accessed June 2010].

allowances) of protein, vitamin A, vitamin C, iron, calcium, and calories. Traditionally, schools used food-based menu planning, which required school meals to offer set numbers of servings from specific food groups, with minimum portion sizes that varied by age. For example, National School Lunch Program meals were required to offer one serving of meat or meat alternatives (cheese, beans), at least one serving of grains or bread, two servings of different fruits and/or vegetables, and one serving of fluid milk. There is an alternative nutrient-based standard for school meals that allows schools greater flexibility in the types of foods offered, but it requires nutrient analysis of planned menus. An enhanced food-based system that calls for larger fruit and vegetable portions and more grains and breads is also available. School meals must meet federal nutrition requirements, but decisions about what specific foods to serve are made by local school food authorities.

Overt identification	The Richard B. Russell National School Lunch Act (Section 9B[10], pp. 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." See http://www.fns.usda.gov/cnd/Governance/Legislation/NSLA-10-2008.pdf [accessed May 2010].
Participation rate	Computed as the average daily number of meals served by category 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. Schools, groups of schools, or school districts establish claiming percentages for fed-

eral reimbursement via 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 and 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 makes 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 in the same proportion of free, reduced price, and full price as was 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.

Provision 4   The term used in this report to refer to a new special provision that would provide free meals to all children, with reimbursement based on estimates from the American Community Survey and other data sources. This provision would require schools, groups of schools, or school districts to count the total number of reimbursable meals served.

School district   The term commonly used for the entity that is responsible for the school meals programs administration 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   A school food authority is defined as the governing body that is responsible for the administration of one or more

	schools and that has 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 the 9 months from September through May.
Verification	A process required by each local education agency (LEA) that participates in the school meals programs and takes applications. 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. The students in households that fail to provide the required documentation are removed from eligibility. Results of the outcomes of verification studies are reported annually on Form FNS-742.

Appendix B

Meeting Agendas

FIRST PANEL MEETING

September 1, 2009

10:00-10:10 am   Introduction of Meeting Participants

10:10-10:30   Purpose of Panel
                  Jay Hirschman, Director, Special Nutrition Staff, Office of
                  Research and Evaluation, and Cindy Long, Director, Child
                  Nutrition Division, *Food and Nutrition Service, USDA*

10:30-11:15   Background on the School Meals Programs
                  Melissa Rothstein, Chief, Policy and Program
                  Development Branch, and William Wagoner, Section
                  Head, School Programs Section, Child Nutrition
                  Division, *Food and Nutrition Service, USDA*

11:15 am-   The American Community Survey
12:00 pm   David Johnson, Chief of the Housing and Household
                  Economic Statistics Division, and Alfredo Navarro,
                  Assistant Division Chief for ACS Statistical Design,
                  U.S. Census Bureau

12:00-1:00   Working Lunch to Continue Morning Discussions

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1:00-1:40   The Small Area Income and Poverty Estimates Program
                Donald Luery, Chief, Small Area Methods Branch
                U.S. Census Bureau

1:40-2:10   Administrative Records for SNAP, TANF, FDPIR, and
                Other Programs: Challenges in Using Them to Prepare
                Counts by School Attendance Areas
                Christopher Logan, Policy Analyst, *Abt Associates*

2:10-2:25   Break

2:25-3:35   Geographical Issues
                The Building Blocks: Census Blocks and Tracts
                Michael Ratcliffe, Geography Division,
                U.S. Census Bureau
                Defining School Attendance Areas from Blocks and
                Tracts in Philadelphia
                Doug Geverdt, Data Integration Division,
                U.S. Census Bureau
                School Attendance Boundary Information System
                (SABINS)
                Salvatore Saporito and Stuart Hamilton,
                College of William and Mary

3:35-4:15   Local Area Requirements and Challenges: What to
                Consider in Designing Case Studies
                John Endahl, Senior Program Analyst,
                Food and Nutrition Service, USDA

4:15-5:00   Discussion

5:00   Adjourn

SECOND PANEL MEETING

October 29, 2009

9:30-9:40 am   Introduction of Meeting Participants

9:40-10:25   Income and Welfare Data: Potential Accuracy of ACS
                Estimates of Eligibility
                John Czajka, *Mathematica Policy Research*

10:25-10:40	Break
10:40-11:30	Profiles of Participants in School Meals Programs and Impact of Income Volatility Constance Newman, *Economic Research Service, USDA*
11:30 am-12:00 pm	Discussion
12:00-1:00	Working Lunch to Continue Discussions
1:00-1:45	The Access, Participation, Eligibility, and Certification (APEC) Study: Erroneous Payments in the NSLP and SBP Michael Ponza, *Mathematica Policy Research*
1:45-2:30	State and District Experiences in Eliminating Reduced-Price Fees and Information on Administrative Costs Kay E. Brown, *U.S. Government Accountability Office*
2:30-3:00	Discussion
3:00-3:15	Break
3:15-4:00	Direct Certification in the School Lunch Program Ed Harper, Chief, *SN Analysis Branch/ORA, Food and Nutrition Service, USDA*
4:00-4:45	School Lunch Program Data Availability and Data Flow Gary Vessels, *Child Nutrition Division*, *Food and Nutrition Service, USDA*
4:45-5:15	Discussion
5:15	Adjourn

Appendix C

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's Committee on National Statistics, he has served on panels on (1) the Design of the 2010 Census Program of Evaluations and Experiments, (2) Research on Future Census Methods, (3) Formula Allocations, and (4) 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. He has an A.B. in statistics from Princeton University and a Ph.D. in economics from the University of Pennsylvania.

DAVID M. BETSON is associate professor of economics 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 served on 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; as chair of the Panel on Evaluation of USDA's Methodology for Estimating Eligibility and Participation for the WIC Program; the Panel on Poverty and Family Assistance; and the Panel to Evaluate Microsimulation Models for Social Welfare Programs. In 2004, he was designated a lifetime national associate of the National Academies. His 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 on the development of their child support guidelines. In 2007, he was appointed to the Washington State Commission on the Review of Child Support Guidelines. He has a Ph.D. in economics from the University of Wisconsin at Madison.

MARIANNE P. BITLER is 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 articles on participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (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*. She has 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. Formerly, he was assistant and associate professor in the Department of Statistics and member of the Survey Section of the Statistical Laboratory at Iowa State University. This section has as major focus design and estimation for large-scale environmental surveys, particularly the U.S. Department of Agriculture's National Resources Inventory. His research interests include time series, environmental monitoring, and survey sampling. He is a fellow of the American Statistical Association and winner of the 2004 Distinguished Achievement Award

from the American Statistical Association Section on Statistics and the Environment. At the National Research Council, he has 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 looked at alternatives to the multiperiod estimation strategy for the ACS. He has 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, including survey design, estimation, variance estimation, imputation and analysis of missing data, statistical modeling of data from complex samples, and small-area estimation. He is a member of the Advisory Committee on Statistical Methods to Statistics Canada and served on the Federal Committee on Statistical Methodology as well as its Subcommittee on Small-Area Estimation. His recent presentations and papers deal with using model-assisted estimation to integrate survey and administrative data in the American Community Survey. He has done considerable research on variance estimation. He received the Roger Herriot Award for Innovation in Federal Statistics 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. He has 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 the director of the Office of Analysis, Nutrition and Evaluation at the Food and Nutrition Service of the U.S. Department of Agriculture until her retirement in 2007. There she directed a staff that conducted research and developed data analysis systems to evaluate the performance 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; the Supplemental Nutrition Program for Women, Infants, and Children; and the Child Nutrition Programs, including the National School Breakfast and School Lunch Programs. She has in-depth experience in food assistance policy and management systems as well as nutrition education and outreach strategies, and she has been the recipient of numerous USDA awards. She has an M.A. in human resources development from American University.

MICHAEL F. GOODCHILD is professor in the Department of Geography and director of the Center for Spatial Studies at the University of California, Santa Barbara. He is associate director of the Alexandria Digital Library, director of the Center for Spatially Integrated Social Science, and chair of the National Center for Geographic Information and Analysis. He is a member of the National Academy of Sciences and the American Academy of Arts and Sciences and a foreign fellow of the Royal Society of Canada. At the National Research Council, he serves on the Board on Research Data and Information, the Committee on Strategic Directions for Geographical Sciences in Next Decade, and the Committee on Applied and Theoretical Statistics. Among his awards are the Prix Vautrin Lud, the Lifetime Achievement Award from the Geospatial Information and Technology Association, the Robert T. Aangeenbrug Distinguished Career Award from the Geographic Information Science and Systems Specialty Group of the Association of American Geographers, the Founder's Medal from the Royal Geographical Society, and the designation Educator of the Year by the University Consortium for Geographic Information Science. His research achievements center on the measurement, description, and analysis of phenomena on the surface of the earth. He has explored using digital information gathered by remote-sensing satellites to create spatial and environmental models of the planet, make maps, and create digital libraries of geographic information that can be widely accessed electronically. He has also developed mathematical models to help quantify the difference between these geographic measurements and the real world. He has a Ph.D. in geography from McMaster University.

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) and as a member of EIA's senior staff from January 2002 through January 2008, when she retired from federal service. 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 the desk officer for the U.S. Census Bureau and chair of the Federal Committee on Statistical Methodology and led a variety of interagency activities. She is a fellow and past vice president of the American Statistical Association and a past president of the Washington Statistical Society. She is a recipient of the American Statistical Association's Founder's Award and the Roger Herriot Award for Innovation in Federal Statistics. For the National Research Council, she was a member of the Panel on Modernizing the Infrastructure of the National Science Foundation's Federal Funds Survey. She has a Ph.D. in mathematical statistics from George Washington University.

PARTHA LAHIRI is professor of statistics in the Joint Program in Survey Methodology at the University of Maryland and research professor at the Institute of Social Research, University of Michigan. He is a fellow of the American Statistical Association (ASA) and the Institute of Mathematical Statistics and an elected member of the International Statistical Institute. He was a senior research fellow at the Bureau of Labor Statistics in 1990-1991 and 2004-2005; a senior research fellow at the U.S. Census Bureau from 1990 to 1991; and a member of the ASA Census Advisory Committee from 2002 to 2007, serving as its chair from 2006 to 2007. His research interests include survey sampling, small-area estimation, record linkage, model selection, Bayes and empirical Bayes inference, and multilevel models. He has given many workshops and short courses on small-area estimation. He has a Ph.D. in statistics from the University of Florida.

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 Fairfax County school system. She and her coauthors were winners of *Food Management Magazine*'s Best Concept Award for Best Wellness Initiative in 2007 with their entry "Nutrition Integrity in the Energy Zone," which describes a national model of a comprehensive, multidepartment wellness program that targets not only students, but also adults. She was president of the School Nutrition Association (formerly, the American School Food Service Association) and currently serves as the chair of the Global Child Nutrition Forum. She was president of the Virginia School Nutrition Association, where she is currently a member of the School Health Advisory Council, the Virginia Action for Healthy Kids, and the Public Policy and Legislation Committee. She received the 1999 Silver Plate Award in the elementary and secondary school category. She is a registered dietitian (RD) and chartered School Foodservice and Nutritionist Specialist (SFNS). She has a B.S. in home economics from the University of Manitoba and an M.S. in education from Virginia Polytechnic Institute and State University.

SARAH NUSSER is professor in the Department of Statistics, director of the Center for Survey Statistics and Methodology, and a faculty member in the Human Computer Interaction Graduate Program and Ecology and Evolutionary Biology Graduate Program at Iowa State University. She is also a member of the Iowa State University Geographic Information System Facility steering committee. Her research interests include using geospatial data in survey data collection and estimation, estimation methods for land cover map accuracy assessment, and sample design and measurement in surveys. She is familiar with the American Community

Survey and other Census Bureau surveys via her work with Census Bureau researchers on using geospatial data for address listing and her service on the Census Advisory Committee of Professional Associations. She also has experience with administrative records databases through research involving welfare program evaluation and numerous operational survey projects. She was a senior research fellow at the Bureau of Labor Statistics through the American Statistical Association/National Science Foundation/Bureau of Labor Statistics research fellowship program from 2000 to 2001. She received the 2007 Distinguished Achievement Award from the Section on Statistics and the Environment of the American Statistical Association. She is a fellow of the American Statistical Association. At the National Research Council, she served on the Panel on Social Security Representative Payees. She has a Ph.D. in statistics from Iowa State University.

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 with the Texas Education Agency and assistant commissioner for food and nutrition with the Texas Department of Agriculture. As the state director, he administered the child nutrition programs in over 1,100 school districts and 8,000 schools in Texas, which involved the interpretation and implementation of federal and state regulations, directing monitoring and compliance reviews of participating school districts, and the disbursement of over $1 billion in federal and state funds. He was the primary architect of the new comprehensive Texas Public School Nutrition Policy. He worked with school administrators, parents, 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 the USDA Southwest Region State Director Representative for over 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 committees. He has an M.A. from the University of Texas, Austin, with a major in accounting and finance.

JAMES H. WYCKOFF is professor in the Currie School of Education at the University of Virginia. Formerly, he was professor of public administration, public policy, and economics at the State University of New York at Albany. He is a member of the National Center for Analysis of Longitudinal Data in Education Research (CALDER) New York team, directs the Education Finance Research Consortium, and serves on the Policy Council for the Association of Public Policy Analysis and Man-

agement and the editorial boards of *Education Finance and Policy* and the *Economics of Education Review*. He is a member of the Scientific Review Panel of the U.S. Department of Education and was an American Statistical Association fellow at the U.S. Census Bureau. His research focuses on the economics of education and state and local public economics. He has published on a variety of topics in education policy, including issues of teacher labor markets, school resource allocation, and school choice. Currently, he is working with colleagues to examine the attributes of New York City teachers and their preparation that are effective in increasing the performance of their students and the retention of effective teachers. 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 currently serves on the Committee on the Study of Teacher Preparation Programs. He received the Association of Teacher Educators Distinguished Research Award in 2007. He has a Ph.D. in economics from the University of North Carolina at Chapel Hill.

COMMITTEE ON NATIONAL STATISTICS

The Committee on National Statistics (CNSTAT) was established in 1972 at the National Academies to improve the statistical methods and information on which public policy decisions are based. The committee carries out studies, workshops, and other activities to foster better measures and fuller understanding of the economy, the environment, public health, crime education, immigration, poverty, welfare, and other public policy issues. It also evaluates ongoing statistical programs and tracks the statistical policy and coordinating activities of the federal government, serving a unique role at the intersection of statistics and public policy. The committee's work is supported by a consortium of federal agencies through a National Science Foundation grant.