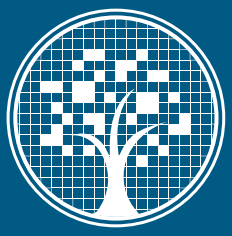

H·CUP

HEALTHCARE COST AND UTILIZATION PROJECT

HCUP Methods Series

Final 2001 NIS Comparison Report

Report # 2004-04

Agency for Healthcare Research and Quality

U.S. Department of Health and Human Services
Agency for Healthcare Research and Quality

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EXECUTIVE SUMMARY

This report compares statistics calculated from the 2001 Nationwide Inpatient Sample (NIS) with estimates from two comparable databases – the National Hospital Discharge Survey (NHDS) and the Medicare Provider Analysis and Review (MedPAR) – with the objective of assessing potential biases. The report focuses on important inpatient outcomes. Outcomes examined include: total discharges, length of stay, in-hospital mortality rates, and total hospital charges. In addition to national statistics, these data were also evaluated across several categories, including procedure and diagnosis groupings, expected payer, patient demographics, region, and hospital characteristics.

NIS Background

The 2001 NIS was established as part of the Healthcare Cost and Utilization Project (HCUP) to provide data supporting analyses of hospital utilization across the United States. NIS data were selected using a stratified probability sample of hospitals, drawn from a frame of 33 states. Sampling probabilities were calculated to select 20 percent of the universe in each stratum defined by hospital characteristics (region, urban/rural location, number of beds, teaching status, and ownership/control). As a result, the NIS includes approximately 7.5 million discharges from 984 hospitals, with weights to facilitate national estimates. It is important to note that NIS data differed in scope from the two comparison databases in three ways:

- Only 33 states agreed to make their data available for the NIS project.
- The sampling frame consisted of all 50 states for the NHDS.
- The MedPAR data set is not a sample; it is a census of Fee-For-Service Medicare discharges.

NHDS Background

In 2001, the National Center for Health Statistics drew a sample of more than 330,000 short-stay discharges from 448 hospitals, including both general-specialty and children's hospitals for the NHDS data set. Statistics from the NHDS are considered geographically representative because the NHDS sampling frame was relatively unrestricted.

MedPAR Background

Obtained from the Centers for Medicare and Medicaid Services (CMS, formerly the Health Care Financing Administration), MedPAR data include all paid fee-for-service Medicare discharges from Medicare-certified, short-stay U.S. hospitals. For calendar year 2001, a total of 12.0 million discharges from U.S. community hospitals were included. Of special importance is the fact that MedPAR data underreported total Medicare discharges by omitting most managed care discharges (approximately 15% of Medicare patients). This particular omission has significant implications for the various comparisons between the MedPAR and NIS data files.

Methods

Outcome statistics compared in the NIS, NHDS, and MedPAR databases included:

- Total number of discharges
- Average length of stay
- In-hospital mortality rate
- Average total charges (NIS and MedPAR only).

These measures of utilization and outcomes were selected because they are common in health services research and serve important roles in health policy and resource planning analyses.

Both the NIS and NHDS are samples, and statistics derived from them are estimates. Comparisons between NIS and NHDS estimates utilized two-sample *z*-tests. MedPAR data, in contrast, are not a sample. The NIS-MedPAR comparisons employed one-sample *z*-tests, which are useful in comparing an entire population (MedPAR) with sample estimates (NIS).

The report cautions that estimates cannot be expected to be identical when two different samples are taken. When viewing results, readers should note that statistically significant differences between the NIS and the NHDS can be expected for a number of reasons; these include:

- Random variation between the two samples
- Differences in sampling strategies
- The NHDS practice of reordering some diagnosis codes
- The sheer volume of tests conducted.

Considering all of these possible reasons for encountering significant differences among the samples, data analyses revealed remarkable similarity among the estimates.

Major Findings

NIS estimates of essential health care policy variables (i.e., in-hospital mortality, inpatient population size, length of stay, and costs) are accurate and precise. The estimates were drawn from states that encompass 76 percent of all short-stay hospitals and more than 81 percent of U.S. discharges. The large NIS sample allows for the study of relatively uncommon disorders, procedures, and hospital types; in fact, NIS estimates can be calculated for any number of special sub-populations. In addition, the NIS contains hospital charges and all payers.

A summary of overall and regional comparisons:

- NIS estimates – of discharge count, average length of stay, and in-hospital mortality rate measures – were statistically consistent with NHDS estimates.

- The NIS overestimated discharges (by 21 percent) for Medicare patients when compared with MedPAR statistics. This discrepancy was likely rooted in the omission of managed care patients from the MedPAR file.

- NIS-MedPAR discharge differences were greatest in the Northeast and West – regions with the highest Medicare managed care penetration. This finding was consistent with the hypothesis that MedPAR data underreport Medicare managed care discharges, such as Medicare+Choice. When we examined the percentage of discharges in each region, only two significant different were observed: NIS estimates were higher in the West and lower in the Midwest.

- Estimates of average length of stay, in-hospital mortality, and average total hospital charges from the NIS were consistent with MedPAR statistics.

Comparisons by hospital characteristics:

- NIS discharge estimates differed from NHDS estimates by reporting relatively more discharges from larger hospitals and relatively fewer discharges from smaller hospitals. NIS estimates by hospital size, however, closely approximated counts from the American Hospital Association.

- NIS discharge estimates consistently exceeded MedPAR statistics, consistent with the absence of most Medicare managed care discharges from MedPAR data, although the proportion of NIS and MedPAR discharges in the hospital categories was generally consistent.

- Average length of stay, in-hospital mortality, and average total charge estimates from the NIS were consistent with NHDS estimates and MedPAR statistics for most hospital categories.

Comparisons by patient characteristics:

- NIS and NHDS estimates were virtually identical across all patient categories (age group, gender, and race) for discharges, average length of stay, and in-hospital mortality rate. All NIS and NHDS estimates by expected payer were consistent, except for discharges with missing or unknown payer information.

- Most NIS estimates of Medicare discharges differed from corresponding MedPAR counts, with higher NIS estimates in most cases. Race was not available for approximately one-quarter of NIS discharges, while less than one percent of MedPAR discharges lacked race information.

- NIS-MedPAR differences also occurred for most estimates of age group discharge proportions. In general, the NIS overestimated Medicare patients aged 65-84 and underestimated Medicare patients younger than 65 and older than 84.

- Most NIS Medicare estimates of average length of stay and average hospital charge were consistent with corresponding MedPAR statistics. Differences for average length of stay were discovered only for the category of missing race. However, several NIS in-hospital mortality rate estimates varied from MedPAR statistics.

Comparisons by diagnosis and procedure categories:

- NIS and NHDS estimates of discharges and average length of stay were generally consistent across diagnosis categories. Many of the differences that were observed can be attributed to coding changes employed in the NHDS: the NHDS recodes diagnosis codes in certain circumstances, while the NIS does not.

- NIS in-hospital mortality rate estimates for specific diagnosis and procedure categories often differed from NHDS estimates. Only some of these differences can be linked to the recoding of NHDS diagnosis.

- The rank order of the most common diagnosis and procedure categories was nearly identical for the NIS and NHDS. Similarly, the NIS and MedPAR had almost identical rankings for the most common diagnosis and procedure categories within the Medicare population.

- Because of the omission of managed care patients in the MedPAR data, the NIS discharge estimates were higher for all diagnosis categories. But there were few differences between the NIS and MedPAR in total charges, inpatient mortality, or length of stay.

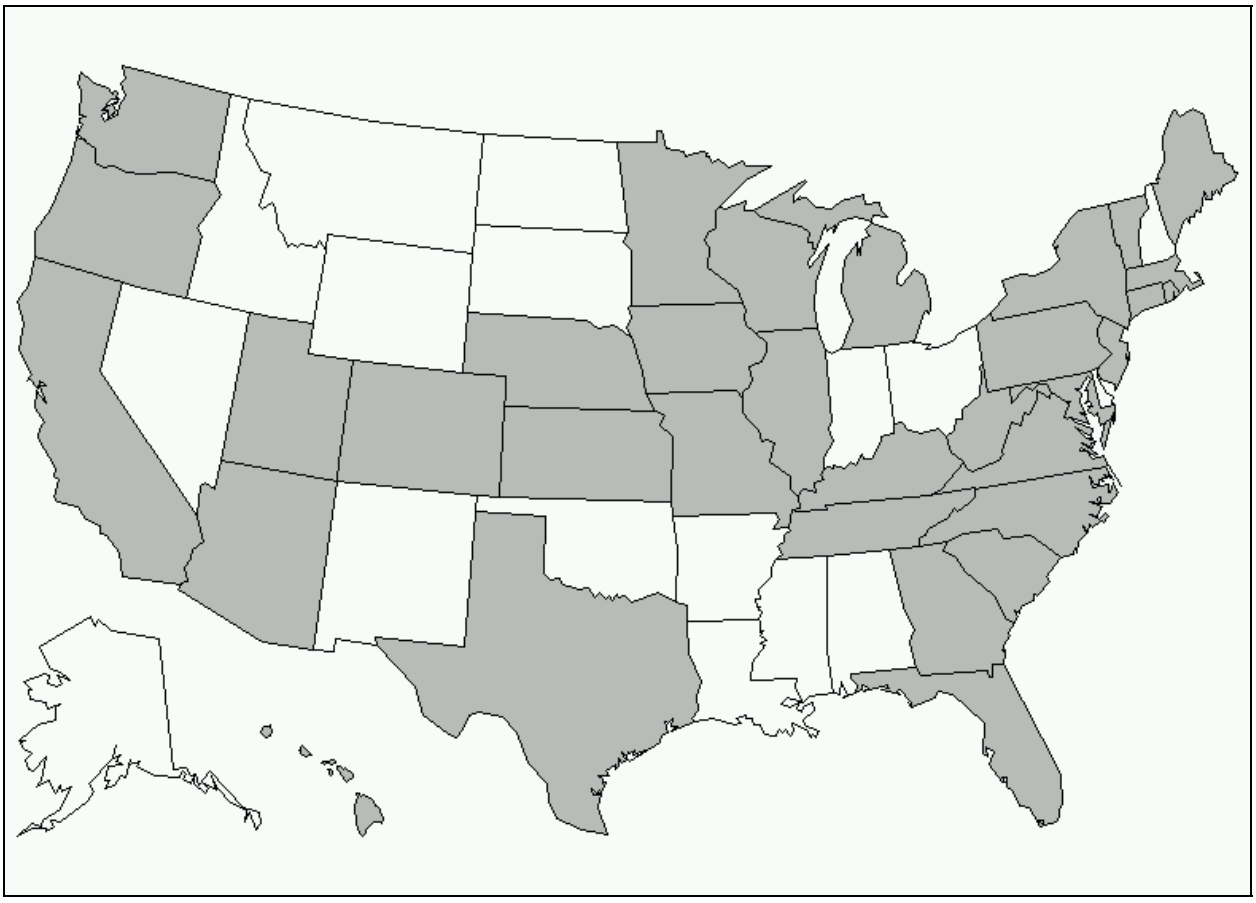
Conclusion

Each data source possesses distinct strengths and weaknesses and may be regarded as the optimum choice for answering different research questions. In general, NIS estimates of essential health care policy variables are accurate and precise. The NIS offers a large sample that might allow for the study of disorders, procedures, and hospital types that occur with low frequency in other databases. NIS estimates can be calculated for thousands of special sub-populations that may be of interest to researchers. The NHDS sample and MedPAR data were drawn from all 50 states, while only 33 states were included in the NIS database. However, for 2001, NIS states encompassed 76 percent of all short-stay hospitals and more than 81 percent of all U.S. discharges. The NIS contains charges for each hospital stay, all payers, and a large sample of discharges. In contrast, the NHDS has a smaller number of discharges, does not contain charges, but does sample from all 50 states. The MedPAR database is limited to Medicare discharges and contains all Medicare patients covered by the fee-for-service program, but excludes Medicare patients enrolled in managed care plans.

INTRODUCTION

This report compares statistics estimated from the Nationwide Inpatient Sample (NIS), a database containing patient-level information from a sample of hospital discharges in the year 2001, with estimates from two other data sources. These comparisons will interest researchers who intend to make inferences about hospital outcomes using the 2001 NIS. This report is the seventh in a series; the six previous reports compared the NIS with other data sources for the years 1991, 1993, 1995, 1997, 1999, and 2000, respectively. These data years correspond to NIS releases that expanded the number of states contributing data – the first release sampled discharges from only eight states, while this latest release sampled discharges from the 33 states shown in Figure 1:

Figure 1. States Participating in the NIS, 2001



Although NIS coverage of U.S. discharges is impressive (these states include more than 81 percent of all discharges from community hospitals nationwide during 2001), the possibility remains that hospital outcomes from these states may differ from hospital outcomes in the states not covered by the NIS.

Created as a part of the Healthcare Cost and Utilization Project (HCUP) and funded by the Agency for Healthcare Research and Quality (AHRQ), the NIS contains all discharges from a sample of community short-stay hospitals stratified by geographic region, urban vs. rural

characteristics, teaching status, bed size, and type of ownership. The hospital sample was drawn from the participating states indicated in Figure 1. The final sample contained 7.4 million discharges from 986 hospitals. We compared outcomes from this sample with outcomes from two other hospital discharge databases: 1) the 2001 National Hospital Discharge Survey (NHDS), and 2) the 2001 Medicare Provider Analysis and Review (MedPAR) file.

The 2001 NHDS was created under the auspices of the National Center for Health Statistics (NCHS). Compared with the 2001 NIS, the 2001 NHDS featured a much smaller sample containing only 330,210 discharges from 438 hospitals. However, the sample was drawn from a frame that included nearly all hospitals in each of the 50 states. The NHDS sampled non-federal short-stay hospitals in the United States, and then sampled discharges from each of the sampled hospitals. Although the smaller sample size rendered the NHDS estimates less precise than the NIS estimates, the complete coverage of states and the NHDS sampling design minimized the potential bias for national estimates of hospital outcomes. This characteristic is the reason it was used as a comparative database in this study.

The 2001 MedPAR, obtained from the Centers for Medicare & Medicaid Services (CMS), included about 11.3 million fee-for-service Medicare discharges from more than 5,000 Medicare-certified, short-stay United States hospitals. It was not a *sample* of Medicare discharges. The MedPAR was nearly ideal for comparing NIS estimates of Medicare inpatient outcomes because it represented close to the entire population of Medicare discharges. As a comparative database, its main weakness was that it excluded Medicare managed care enrollees; these individuals accounted for 15.4 percent of the Medicare inpatient experience in 2001.

We compared the estimates from the 2001 NIS with estimates from the 2001 NHDS and the 2001 MedPAR on the following inpatient outcomes:

- Total discharge counts
- Average length of stay (ALOS)
- Inpatient mortality rate
- Average total charges (NIS and MedPAR only).

While many other statistics can be estimated from these data, hospital research commonly focuses on these outcomes. To the extent that the NIS generates reasonable estimates for these outcomes, it is likely that estimates for other, similar outcomes will also be reasonable.

Estimates from the three data sources were compared at the national level, as well as within hospital groups and patient categories. We grouped hospitals and evaluated estimates by geographic region, bed size, ownership, urban vs. rural location, and teaching status. We also categorized patients and compared estimates within age group, gender, race, primary payer, diagnosis category, and procedure category.

In addition, we compared weighted and unweighted frequencies between the 2001 NIS sample and the 2001 Hospital Survey of the American Hospital Association (AHA). These comparisons are purely descriptive because the NIS sample weights were derived from the AHA survey. Consequently, there was close agreement between the two sources by construction.

This report is divided into four sections. The first section describes the NIS and recent changes in the sampling strategy. The second section provides a discussion of the NHDS, the MedPAR file, and the methodology used in the analysis. The third section presents the results, and the final section includes a discussion and posits some conclusions.

BACKGROUND INFORMATION ON THE HCUP AND NIS

HCUP is a Federal-State-Industry partnership formed to build a standardized, multi-state health data system. In September 2000, AHRQ provided funding to the HCUP project for Medstat to continue developing and expanding this health data system through data year 2003. The 2001 NIS was established as part of HCUP to provide analyses of hospital utilization across the United States.

The 2001 NIS universe included all acute-care discharges from all community hospitals in the United States. It comprised all discharges from a sample of hospitals in this target universe. However, the NIS sampling frame was constructed from the subset of universe hospitals that released discharge data for research use. For the 2001 NIS, AHRQ had agreements with 33 Partner organizations that maintain statewide, all-payer discharge data files. The 2001 NIS contains data from each of these states; this participation reflects an increase of five more states than the previous release and 25 more states than the first release.

Table 1 indicates how the NIS sampling frame has grown. It lists the states included in each NIS release, for data years 1988 through 2001.

Table 1. States in the Frame for NIS Releases

Years	States in the Frame
1988	California, Colorado, Florida, Iowa, Illinois, Massachusetts, New Jersey, and Washington
1989-1992	Add Arizona, Pennsylvania, and Wisconsin
1993	Add Connecticut, Kansas, Maryland, New York, Oregon, and South Carolina
1994	No new additions
1995	Add Missouri and Tennessee
1996	No new additions
1997	Add Georgia, Hawaii, and Utah
1998	No new additions
1999	Add Maine and Virginia
2000	Add Kentucky, North Carolina, Texas, and West Virginia
2001	Add Michigan, Minnesota, Nebraska, Rhode Island, and Vermont

As with previous releases of the NIS, the 2001 NIS sampling frame was subject to further restrictions.

- The Illinois Health Care Cost Containment Council stipulated that no more than 40 percent of Illinois discharge data could be included in the database for any discharge quarter. Thirty-three percent of the discharges supplied by Illinois were sampled in the 2001 NIS. No hospitals were dropped from the sampling frame.

- Forty-one out of 137 Michigan hospitals (30 percent) were dropped from the sampling frame because they did not report total charges. These hospitals were fairly evenly distributed by hospital type, and their removal did not deplete any Michigan sampling strata: hospitals remained in all strata. After dropping the 41 hospitals, the weakest sampling strata in Michigan were small- and medium-sized teaching hospitals. In this case, only 40 percent of small-sized and 30 percent of medium-sized teaching hospitals were eligible for inclusion in the 2001 NIS.

- Hospitals in Missouri had the option to withhold data from the NIS. A total of 104 community hospitals supplied data to the HCUP project in 2001; however, 32 of those hospitals decided to withhold data from the 2001 NIS.

- Georgia, Hawaii, Nebraska, and South Carolina all imposed "small cell" restrictions, which required that we exclude hospitals from the 2001 NIS when a sampling stratum contained a single hospital. This restriction eliminated from the NIS sampling frame two Georgia hospitals, four Hawaii hospitals, one Nebraska hospital, and six South Carolina hospitals. Michigan and Tennessee also have similar confidentiality requirements, but no hospitals from these states were dropped from the 2001 NIS sampling frame.

- Three additional Nebraska hospitals were dropped from the sampling frame because of a large percentage of missing Medicare discharges in the data supplied to HCUP.

- Some Texas hospitals, mostly small rural hospitals, were exempt from statutory reporting requirements. As a result, only 288 of the 408 Texas community hospitals (excluding rehabilitation facilities) supplied data to HCUP for the 2001 NIS.

- In one Utah hospital, misidentification of coronary care unit (CCU) discharges as long-term care discharges caused the coronary care unit discharges to be excluded from the source files provided to HCUP. In the 2001 NIS, 509 CCU discharges were missing from the source file provided to HCUP and were therefore not included in the 2001 NIS. These missing discharges included open heart surgeries and other DRGs in the range 103 to 145.

NIS Design

The NIS is a stratified probability sample of hospitals in the frame, with sampling probabilities calculated to select 20 percent of the universe contained in each stratum. Beginning in 1998, NIS databases differed from previous years of the NIS because of a sampling redesign. Therefore, longitudinal comparisons of the NIS might indicate differences that can be attributed to the following changes in the sampling design:

1. Prior to 1998, the NIS design ensured that hospitals drawn for the sample in one year had a high probability of being drawn for the sample in the following year. Including the same hospitals across years improved the precision of trend analyses, although it may have introduced some form of bias into one or more years of the hospital sample. Medstat and AHRQ decided to discontinue any sampling scheme that increased the chance that hospitals would be included in successive years of the NIS.

2. We found that patients treated in short-term rehabilitation hospitals tend to have lower mortality rates and longer lengths of stay than patients in other community hospitals. In

addition, the completeness of reporting for rehabilitation hospitals is uneven across the states. Therefore, we decided to eliminate rehabilitation hospitals from the NIS (and from the target universe).

3. In previous NIS designs, we employed strata for geographic region, hospital ownership, urban/rural location, and teaching status. We identified strata that could be nested or collapsed, in order to avoid small cells in the final sample. This process reduced the number of NIS strata from 108 to 60, beginning with the 1998 NIS.

4. In the previous NIS, bed size categories were defined only within location/teaching status. However, even within these location/teaching categories, the bed size distributions still varied widely by geographic region. We decided to define small, medium, and large bed size categories nested within region and location/teaching category such that approximately one-third of the hospitals would be allocated to each category.

5. Prior to 1998, we stratified all hospitals into one of three ownership categories: public, voluntary, and proprietary. In several geographic regions, however, some ownership categories rarely occurred. Therefore, we used all three ownership categories for rural hospitals in the South and for urban non-teaching hospitals in the South and West. However, in the West and Midwest regions, we collapsed the proprietary and voluntary hospitals into a new “private” ownership category.

6. Finally, we redefined teaching hospitals. In prior versions of the NIS, a hospital was designated a teaching hospital only if it had some interns or residents, and it was either a member of the Council of Teaching Hospitals or had an AMA-approved residency program. The new definition still defines those same hospitals as teaching hospitals. However, it also includes all hospitals with a ratio of interns and residents to beds of 0.25 or higher. This intern-to-bed ratio is similar to a component of the Centers for Medicare & Medicaid Services’ (CMS, formerly the Health Care Financing Administration) definition of teaching hospitals for Medicare payments.

NIS Sampling

The overall sampling objective was to select a sample of hospitals that could be generalized to the target universe, including hospitals outside the frame (which had a zero probability of selection). To improve the generalizability of the NIS estimates, five hospital sampling strata were used:

1. Geographic Region – Midwest, Northeast, West, and South.

2. Ownership – public, private non-profit, and proprietary (private or investor-owned).

3. Location – urban and rural.

4. Teaching Status – teaching and non-teaching. (Rural hospitals were not split according to teaching status, because rural teaching hospitals were rare.)

5. Bed Size – small, medium, and large. Bed size categories were based on hospital beds, and were specific to the hospital's location and teaching status, as shown in Table 2. Bed size cut points were chosen so that approximately one-third of the hospitals in a

given region/location/teaching combination would appear in each bed size category. This approach creates different divisions – small, medium, and large – for rural, urban non-teaching, and urban teaching hospitals. For example, a medium-sized urban, teaching hospital would be considered a rather large rural hospital. Further, the size distribution was different among regions for each of the urban/teaching categories. Using differing cut points in this manner avoids strata containing small numbers of hospitals.

Table 2. Bed Size Categories

Location and Teaching Status	Hospital Bed Size		
	Small	Medium	Large
Northeast			
Rural	1-49	50-99	100+
Urban, non-teaching	1-124	125-199	200+
Urban, teaching	1-249	250-424	425+
Midwest			
Rural	1-29	30-49	50+
Urban, non-teaching	1-74	75-174	175+
Urban, teaching	1-249	250-374	375+
South			
Rural	1-39	40-74	75+
Urban, non-teaching	1-99	100-199	200+
Urban, teaching	1-249	250-449	450+
West			
Rural	1-24	25-44	45+
Urban, non-teaching	1-99	100-174	175+
Urban, teaching	1-199	200-324	325+

To further improve proportional geographic representation, hospitals were sorted by state and by the first three digits of their ZIP Code prior to systematic sampling. Refer to *Design Report: HCUP Nationwide Inpatient Sample 2001* for more details on the sampling design.

NIS Weights

Sample weights were developed for the NIS to obtain national estimates of the hospital and inpatient parameters. For example, weights make estimates of diagnosis-specific average lengths of stay over all U.S. hospitals possible. Within each stratum, the discharge weight was set at the ratio of discharges in the universe (estimated from the 2001 AHA hospital survey) to discharges in the sample.

METHODS

NIS statistics were compared with those calculated from two other sources, each of which is described below.

National Hospital Discharge Survey (NHDS)

Conducted by the National Center for Health Statistics (NCHS), the 2001 NHDS included 330,210 discharges from 448 hospitals. The NHDS covered discharges from U.S. hospitals categorized as short-stay (hospitals with an average length of stay under 30 days), including both general-specialty (medical or surgical) and children's hospitals. Federal, military, and Veteran's Affairs hospitals were excluded from the survey.

The NHDS sample included with certainty the largest hospitals: those with a minimum of 1,000 beds, or at least 40,000 discharges. The remaining sample of hospitals was based on a stratified, three-stage design:

- During the first stage selecting 112 primary-sampling units (PSUs) that comprised a probability sub-sample of PSUs used in the 1985-1994 National Health Interview Survey.

- The second stage consisted of selecting non-certainty hospitals from the sampled PSUs. Electronic (purchased) data were available for approximately 41 percent of these hospitals.

- At the third stage, a sample of discharges was selected by systematic random sampling techniques. At this point, electronic data were over-sampled. As a result, approximately 60 percent of NHDS discharges originated from electronic data.

Medical Coding and Edits. The medical information that was recoded manually on the sample patient abstracts was coded centrally by NCHS staff. Up to seven diagnostic codes were assigned for each sample abstract. In addition, if the medical information included surgical or non-surgical procedures, up to four codes for these procedures were assigned. As with the NIS, the system currently used for coding the diagnoses and procedures on the medical abstract forms, as well as on the commercial abstracting services data files, is the *International Classification of Diseases, 9th Revision, Clinical Modification,* or ICD-9-CM.

NHDS usually presents diagnoses and procedures in the order they were listed on the abstract form or obtained from abstract services. However, there were exceptions. For women discharged after a delivery, a code of V27 from the supplemental classification was entered as the first-listed code, with a code designating either normal or abnormal delivery in the second-listed position. In another exception, a decision was made to reorder some acute myocardial infarction diagnoses. If an acute myocardial infarction was listed with other circulatory diagnoses and was other than the first entry, it was reordered to the first position. If a symptom appears as a first-listed code and a diagnosis appears as a secondary code, the diagnosis replaced the symptom, which was moved to appear after the diagnosis.

Table 3. Comparison of 2001 NIS and NHDS Data Files

Characteristics	2001 NIS	2001 NHDS
Number of hospitals	**986**	**448**
Number of discharges	**7,452,727**	**330,210**
Intended universe	Discharges from community hospitals, as defined by AHA – non-federal, short-term general, or other specialty hospitals that were not a hospital unit of an institution. Short-term rehabilitation hospitals were excluded.	Discharges from non-institutional hospitals (excludes federal, military, and VA hospitals) located in the 50 states and the District of Columbia. Only short-stay hospitals (ALOS < 30 days) or those whose specialty is general (medical or surgical) or children's general hospitals are included in the survey.
Bed size	No restriction was placed on bed size in creating the file, but no hospitals in the sample have fewer than six beds.	Must have at least six beds staffed for patient use to be included.
Sample or universe	Sample	Sample
Sampling frame	33 states	50 states and the District of Columbia
Sample design – hospitals	By geographic region, control/ownership, location, teaching status, and bed size.	Includes all hospitals with $\geq$ 1,000 beds or $\geq$ 40,000 discharges annually, plus an additional sample of hospitals in two stages. A sample of 112 PSUs was selected. These PSUs were a probability sample of the counties or metropolitan areas used in the 1985-1994 National Health Interview Survey. A sample of hospitals was selected within these PSUs.
Sample design – discharges	All discharges from sampled hospitals were included.	A systematic random sample of discharges was selected from each hospital.
Reassignment of diagnosis codes	None	For women discharged after delivery, a code of V27 was entered as the first-listed code. If a symptom appeared as a first-listed code and a diagnosis was listed as a secondary code, the diagnosis replaced the symptom. If acute myocardial infarction was listed with other circulatory conditions, it was reordered to the first entry.

Table 3 summarizes some of the key differences in hospitals and discharges represented by the NIS and NHDS data files. Sampling error exists in both the NHDS and the NIS. However, the NIS includes nearly 25 times the number of NHDS discharges and more than twice the number of hospitals than the NHDS. Further, the NIS contains all discharges from sampled hospitals, whereas the NHDS contains a sample of discharges from sampled hospitals. As a result of these sampling differences, statistics calculated from the NIS usually have much smaller standard errors than those calculated from the NHDS. In addition, it was not always possible to calculate valid estimates of standard errors from the NHDS for statistics calculated from rare subpopulations. For example, mortality estimates for low frequency procedures and diagnoses might be based on fewer than a dozen cases in the NHDS, while the same subpopulations could contain hundreds of discharges in the NIS. Statistics from the NHDS were assumed to be representative geographically, because the sampling frame was relatively unrestricted, encompassing all federal, acute-care general U.S. hospitals with six or more beds. In contrast, the NIS sampling frame for 2001 was limited to the 33 states that made their data available for research purposes.

Medicare Provider Analysis and Review (MedPAR)

The MedPAR data obtained from the Centers for Medicare & Medicaid Services (CMS) include all records for each fee-for-service Medicare discharge from a Medicare-certified, short-stay U.S. hospital. Federal fiscal year records for 2001 and 2002 were used to create a calendar year 2001 MedPAR file with nearly 11.5 million discharge records. To ensure that the hospital composition of the MedPAR file was consistent with the NIS universe, only AHA-defined community hospitals – as defined by the American Hospital Association (AHA) – were kept in the MedPAR-derived file for this study. In the MedPAR data, same-day stays (admission and discharge on the same day) were assigned a length of stay of one day. Consequently, in comparisons of average lengths of stay between the NIS and MedPAR data, same-day stays in the NIS were recoded from zero to one for this analysis.

Table 4 summarizes some of the key differences in hospitals and discharges represented by the NIS and MedPAR data files. Medicare discharge statistics from MedPAR have no sampling error associated with them because this file represents a census of 2001 fee-for-service Medicare discharges. However, analyses suggest that the MedPAR data underreport total Medicare discharges by omitting most discharges for managed care. In 2001, 15.4 percent of Medicare enrollees were in managed care, including HMOs (HCFA, 2001). However, only 0.9 percent of calendar year 2001 MedPAR discharges were identified as managed care enrollees, suggesting that more than 14 percent of the Medicare population may have been excluded (15.4 percent in the population - 0.9 percent in the MEDPAR file = 14.5 percent). As will be discussed throughout the report, this omission has significant implications for the various uses of the MedPAR and NIS data files.

Table 4. Comparison of 2001 NIS Medicare Discharges and MedPAR Data Files

Characteristic	2001 NIS (Medicare Only)	MedPAR
Number of hospitals	**977 (with Medicare discharges)**	**6,213**[1]
Number of discharges	**2,749,788**	**12,035,681**[2]
Intended universe	Discharges from community hospitals, except rehabilitation hospitals, as defined by AHA – non-federal, short-term general, or other special hospitals that were not a hospital unit of an institution.	All Medicare discharges. *Only discharges from non-rehabilitation, community hospitals were included, for comparison purposes.*
Bed size	No restriction was placed on bed size in creating the file, but no hospitals in the sample have fewer than six beds.	No restriction was placed on bed size in creating the file, but no hospitals in the sample have fewer than six beds.
Sample or universe	Sample	Universe
Sampling frame	33 states	50 states and the District of Columbia
Sample design – hospitals	By geographic region, control/ownership, location, teaching status, and bed size.	All hospitals included.
Sample design – discharges	All discharges from sampled hospitals were included.	All fee-for-service discharges were included.
Reassignment of diagnosis codes	None	None

[1]*Short-term general and specialty community hospitals.*
[2]*Discharges from short-term general and specialty community hospitals.*

Variables Compared

The following measures were chosen to compare the NIS to the NHDS and MedPAR databases:

- Total number of discharges
- Average length of stay
- In-hospital mortality rate
- Average total charges (NIS and MedPAR only).

These measures of utilization and outcomes were selected because they are common in health services research and important for health policy and resource planning analyses.

The NIS-MedPAR comparison included total hospital charges in addition to the three variables noted previously. When comparing NIS records to MedPAR, only the NIS discharges for which Medicare was the expected primary or secondary payer were used.

Statistical Testing

Estimates derived from both the NIS and NHDS were based on weighted discharge records from stratified samples. The SAS software PROC SURVEYMEANS was used to compute standard errors for the NIS (see the *NIS Variance Report* for details). The stratifier variable included in the NIS (NIS_STRATUM) was specified as the stratum, and the unique hospital identifier (HOSP_ID) was specified as the cluster variable. A description of the method used for calculating standard errors for the NHDS is provided in Appendix D.

NIS-AHA Comparisons

Tables comparing characteristics from AHA universe hospitals and NIS hospitals (Table 7 - Table 8) appear in Appendix A. All numbers in these tables come from the AHA Annual Survey; no significance tests were performed for these tables.

Significance tests were conducted for the discharge comparisons of AHA counts and NIS estimates (Table 9 - Table 11). The AHA data are a population, based on the annual AHA survey, so a one-sample *z*-statistic was computed for these comparisons. AHA discharges represent the survey counts adjusted for the number of well newborns. An estimate of the average length of stay (ALOS) was obtained from the AHA by dividing the total number of days by the total number of discharges reported in the 2001 AHA survey of hospitals.

Same-day discharges from the NIS are recorded with length of stay equal to zero. However, for comparisons with AHA statistics, the length of stay measures for NIS same-day discharges was changed to one day. The standard error for the NIS estimates used in these calculations was generated by the SURVEYMEANS procedure.

NIS-NHDS Comparisons

For each NIS-NHDS comparison, a test was performed to determine whether the NIS and NHDS estimates differed significantly. Because the NIS and NHDS estimates were both based on samples, two-sample z-tests were used where valid estimates of the NHDS standard error could be made. Because of the limited sample size, valid estimates were not available for all breakdowns of the NHDS data. Please see Appendix D for a description of comparison tests and an explanation of restrictions on calculating NHDS sample errors. Differences were reported at the .01 and .05 significance levels.

Tables comparing NIS and NHDS statistics (Table 12 -Table 16) appear in Appendix B.

NIS-MedPAR Comparisons

Because the MedPAR data represent the population, and not a sample, a one-sample *z*-statistic was computed for these comparisons. The standard error for the NIS estimate used in these calculations was generated by the SURVEYMEANS procedure for the subset of NIS discharges with Medicare identified as the principal payer. Same-day discharges from the MedPAR are recorded with a length of stay equal to one day, while same-day discharges from the NIS are

recorded with length of stay equal to zero. So for NIS-MedPAR comparisons, NIS length of stay measures for same-day discharges were changed to one day.

Tables comparing NIS and MedPAR statistics (Table 17 - Table 23) appear in Appendix C.

Comparisons by Diagnosis and Procedure Categories

NIS data were compared with both NHDS and MedPAR data across selected diagnosis and procedure groups. For NHDS comparisons, the 25 diagnoses and procedure groups observed most frequently in the NIS were selected. For MedPAR comparisons, the 25 diagnosis and procedure groups selected were those found most frequently on NIS discharges for which Medicare was the expected payer. The diagnosis and procedure groups represent a majority of pertinent discharges. For both the NHDS and MedPAR comparisons, more than one-half of all discharges were represented by the 25 diagnosis groups, while the 25 procedure groups represent nearly 60 percent of discharges that include procedure codes. In addition, MedPAR comparisons included the 25 most frequent Diagnosis Related Group (DRG) codes found for NIS Medicare discharges.

Grouping of diagnoses and procedures was done with Clinical Classification Software (CCS). The CCS, formerly known as the Clinical Classifications for Health Policy Research (CCHPR), was developed as a means to categorize diagnoses and procedures into a limited number of clinically relevant categories. Developed for health policy analysis, the CCS can be used for aggregating the thousands of ICD-9-CM diagnoses and procedures into a manageable number of meaningful categories. CCS codes were assigned based on the principal, or first-listed, diagnosis and procedure for each discharge.

RESULTS

Estimates from different samples will not be identical because of sampling variation. Statistically significant differences can be expected for a variety of reasons, including different sampling strategies. In addition, recoding of certain conditions – as sometimes occurs in the NHDS – may lead to significant differences in the affected categories. Finally, the sheer number of tests (more than 800), will produce some statistically significant results purely by chance.[1]

NIS-AHA Comparisons

This section refers to tables in Appendix A (Table 7 - Table 11) comparing:

- Hospitals in the NIS sampling frame to the universe of U.S. community hospitals
- NIS estimates with AHA annual survey data.

These tables suggest that NIS hospitals were quite similar to hospitals in the AHA universe; differences between NIS and AHA facilities were generally small. While NIS hospitals tend to have more admissions and discharges than those hospitals in the AHA universe, the average difference was small (approximately 1.5 percent). Median NIS counts, however, were 4.5 percent higher than the AHA numbers, suggesting that NIS hospitals tend to have more discharges than hospitals in the AHA universe. Also, NIS hospitals were slightly smaller than AHA hospitals, although these differences were minor (average: 1.1 percent; median: 2.6 percent). In addition, the average NIS hospital's length of stay – *not adjusted for hospital size or discharges counts* – was on average seven percent shorter than the AHA average.

NIS hospitals also tend to have more Medicare discharges than the universe of U.S. community hospitals (Table 7). The difference was small (approximately 1.1 percent), but it may be a factor, albeit a minor one, in some other differences observed for NHDS and MedPAR comparisons to the NIS.

As shown in Table 8, NIS hospitals tend to perform more surgeries and spend more than hospitals in the AHA universe: both expenses and payroll were slightly higher (1.7 percent) at the NIS facilities. While the differences in averages were slight, the disparity in median values was quite noticeable (10.1 percent for expenses and 7.8 percent for payroll). Expenses and payroll per bed were all higher in NIS hospitals, as was full-time employment per bed.

National and regional NIS discharge estimates (Table 9 - Table 11) closely align with the discharge counts from the AHA survey. This was not surprising because NIS sampling stratum and NIS discharge weights were based on AHA annual survey results. As with the regional comparisons, the AHA-derived sampling weights in the NIS yield hospital counts consistent with AHA universe counts for various categories of hospital types.

For average length of stay (ALOS), however, the NIS sometimes differs from the AHA. While the NIS and AHA numbers were generally in agreement, the overall NIS estimate was 2.4 percent higher than the AHA average. Significant differences were also discovered for several

[1]While some type of correction for the number of tests could be applied, given the number of tests, this would greatly increase the risk of a Type II error.

specific hospital categories. NIS estimates for ALOS were longer – by 2.5 to 3.9 percent – than AHA statistics in

- Southern hospitals (2.5 percent longer)
- Private, non-profit hospitals (3.3 percent longer)
- Urban, non-teaching hospitals (3.9 percent longer)
- Urban, teaching hospitals (3.1 percent longer).

In contrast, for rural hospitals, the NIS estimate was significantly shorter – by 5.4 percent – than the average of AHA facilities. In addition, significant differences were found between the NIS estimates and the AHA numbers for three of the 15 bed size categories within hospital type. Private non-profit hospitals with 100-199 beds and 200-299 beds, and urban, non-teaching hospitals with 100-199 beds had slightly higher ALOS in the NIS.

NIS-NHDS Comparisons

Generally, NIS and NHDS estimates agree. This holds true overall and across patient categories. It was also true for most hospital comparisons and specific diagnosis and procedure categories. Overall, agreements were observed for more than 72 percent of the discharge comparisons. Of the NIS-NHDS differences discovered, most occur in the diagnosis and procedure groupings. The degree of consistency for in-hospital mortality rates was high: estimates agreed for 95 percent of hospital category comparisons and more than 93 percent of comparisons by patient category. Nearly all average length of stay (ALOS) estimates were consistent between the NIS and NHDS; ALOS estimates agreed across all hospital and patient groups. Appendix B includes Table 12 through Table 16, comparing NIS and NHDS estimates. The following sections describe these tables in more detail.

Overall and Regional Comparisons

Overall and by region, no statistically significant differences emerged between the NIS and NHDS data for discharges, ALOS, or in-hospital mortality rates (Table 12). ALOS comparisons could not be made for the Northeast and Midwest, because a reliable standard error for the NHDS estimate could not be determined. However, the magnitudes of the differences between the NIS and NHDS estimates in these regions were small and appear consistent with the non-significant differences shown in other regions.

Comparisons by Hospital Characteristics

NIS and NHDS estimates were similar for each of the three hospital control/ownership categories. But some significant differences for discharge estimates were discovered between the NIS and NHDS in the bed size groupings within control/ownership categories (Table 13).

It is likely that these differences were caused by the composition of the two samples: the NIS has a greater proportion of its discharges from larger hospitals, while the NHDS has a greater proportion of its discharges from smaller hospitals. As a result, the NIS, relative to the NHDS, tends to overestimate discharges from large hospitals and underestimate discharges from small hospitals. Figure 2 and Figure 3 illustrate discharge numbers from the AHA, NIS, and NHDS for two categories in which this was particularly true: private non-profit hospitals and proprietary

hospitals. These charts show that NIS discharge statistics closely agree with AHA numbers, except for proprietary hospitals with 300-499 beds.

Figure 2. Estimated Discharges from Private Non-Profit Hospitals, 2001

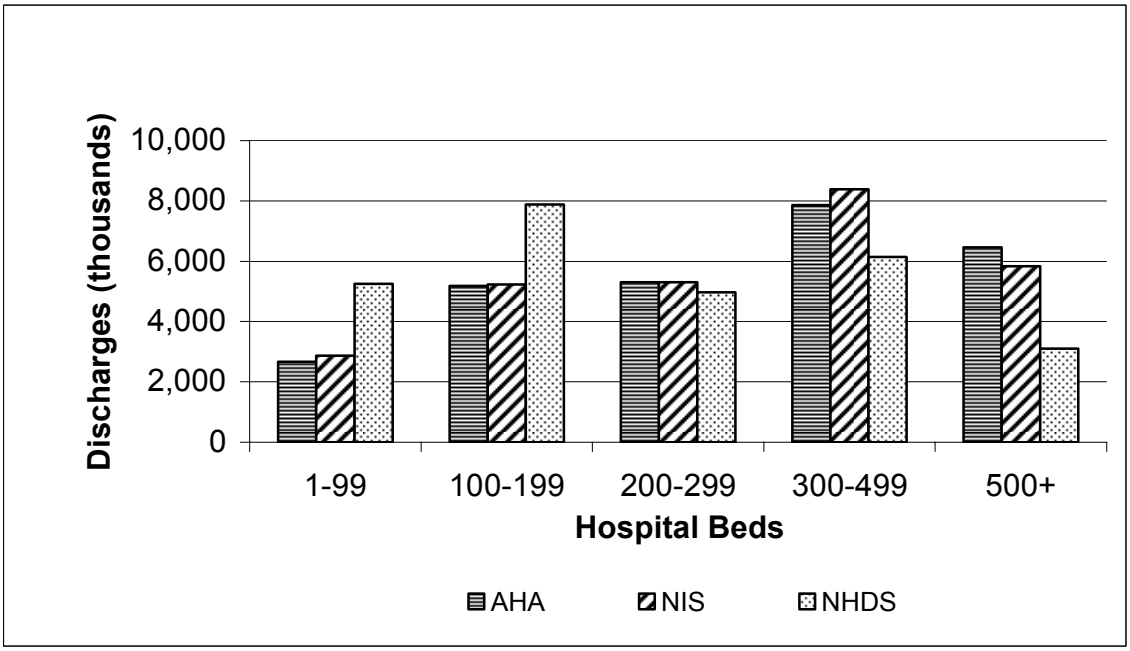
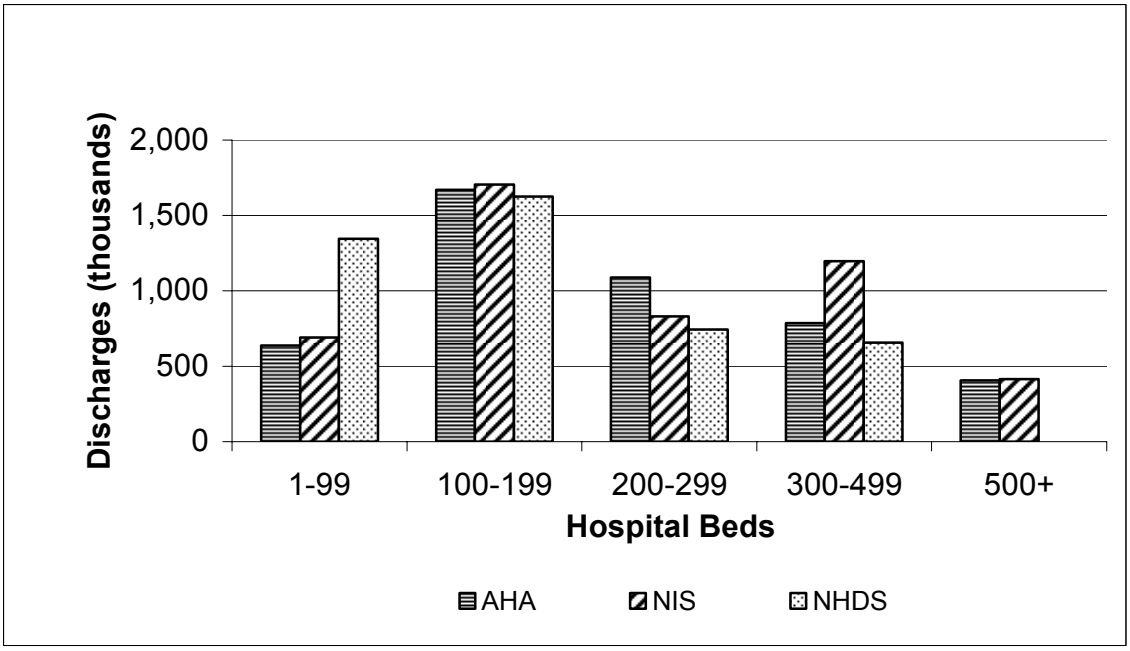


Figure 3. Estimated Discharges from Proprietary Hospitals, 2001



Because of these differences in the samples, significant differences exist in discharge count comparisons by hospital bed size. Significant differences occur with seven of the 14 discharge comparisons by hospital bed size within control/ownership categories. The NIS estimate was lower than the NHDS figure in four cases (categories with fewer than 200 beds) and higher in three other instances (categories with more than 300 beds). The NIS estimate was also higher in a fourth case – proprietary hospitals with 500 or more beds – but no comparison was made because the NHDS estimated zero discharges and a valid estimate of standard error was not available. The NIS estimate for this category was 416,000 discharges. According to the AHA data, there were 406,000 discharges for this category (refer to Table 10), suggesting that the NIS estimate was the more accurate number.

ALOS and in-hospital mortality estimates were consistent, with only two exceptions. The NIS estimates for proprietary hospitals with 1-99 beds was higher than the NHDS statistic by 42 percent, but lower by 25 percent for 100-199 bed proprietary hospitals (Table 13). No comparison was possible for proprietary hospitals with more than 500 beds because no standard error estimate was available for the NHDS statistics (the NHDS reported no discharges from this type of hospital).

Comparisons by Patient Characteristics

For nearly all comparisons by patient categories (Table 14), there was agreement between the NIS and NHDS estimates. The NIS and NHDS samples closely agree across most age groups, gender, and payer categories. There were no differences in ALOS estimates, and only one in-hospital mortality rate disparity emerged: the NIS statistic was lower than the NHDS figure for patients in the "0-15 years" age group. Comparisons were not possible for the unknown/missing categories of age group, gender, and payer because NHDS standard error estimates were not available. However, there were few discharges in these groups.

Comparisons of discharge estimates differed in three categories. For "other payer," the NIS statistic was 41 percent lower than the NHDS estimate (a difference of approximately 752,000 discharges). In contrast, the NIS estimates one million more Medicare discharges than does the NHDS. Although this difference was not significant, it demonstrates that NIS hospitals tend to have slightly more Medicare discharges (1.1 percent) than the universe of hospitals (refer to Table 8).

Table 5. Racial Composition of the U.S., NIS Sample, and NHDS Sample

Race	U.S. Population[2]	NIS Discharges with Race Information	NHDS Discharges with Race Information
White	69%	69%	80%
Black	12%	13%	15%
Other	19%	18%	5%

[2]U.S. Census Bureau, *Annual Estimates of the Population by Sex, Race and Hispanic or Latino Origin for the United States: April 1, 2000 to July 1, 2003* (NC-EST2003-03).

Two discrepancies occurred in race categories. The racial composition of the two samples differed greatly. The NHDS contains proportionately more discharges for white patients, while the NIS contains proportionately more discharges for "other" race patients. Both samples include large numbers of discharges without racial information; the information was missing for 26 percent of NIS discharges and 23 percent of NHDS discharges. Some states do not report race/ethnicity to HCUP, so for these states race is missing in the NIS.[3] Because the NHDS does not include state information, it is not possible to determine if the pattern of missing information is similar. Looking only at discharges with race information, however, the NIS was more representative of the U.S. population than the NHDS, as shown in Table 5.

Comparisons by Diagnosis Category

Comparisons for diagnosis categories revealed a great deal of consistency between the NIS and NHDS samples (Table 15). The majority of comparisons in these categories show no significant differences. NIS discharge estimates differed significantly from NHDS estimates for nine of the 25 most common diagnosis categories; the NIS estimate was higher in four categories and lower in the remaining five groupings:

NIS Estimates Higher than NHDS	NIS Estimates Lower than NHDS
• "Nonspecific chest pain"	• "Affective disorders"
• "Other complications of birth, puerperium affecting management of mother"	• "Fluid and electrolyte disorders"
	• "Normal pregnancy and/or delivery"
• "Complication of device, implant/graft"	• "Urinary tract infections"
• "Other complications of pregnancy"	• "Asthma"

Of these nine significant differences in the number of discharges, four can be attributed to code reordering in the NHDS ("nonspecific chest pain," and three pregnancy/delivery categories). In contrast to the NHDS, there was no reordering of diagnoses for NIS data: the first diagnosis listed for each discharge was assigned as the principal diagnosis. Diagnoses were reordered in the NHDS under certain conditions. For example, when a symptom appeared as the first-listed code, it was reassigned as a secondary diagnosis. This explains the dramatically higher figure for non-specific chest pain in the NIS sample, as compared with the NHDS (nearly 14 times higher).

Of the 25 most common diagnoses, four relate to pregnancy and delivery, including the category "normal pregnancy." Significant differences emerged for three of these categories. (No statistical comparison was possible for the fourth category, "trauma to the perineum and vulva," because a valid estimate of the NHDS standard error was not available.) Again, the differences between the NIS and the NHDS can be attributed to reordering of diagnosis codes in the NHDS data.

[3]NIS states for which race was not available include Georgia, Illinois, Kentucky, Maine, Minnesota, Nebraska, Nevada, Ohio, Oregon, Washington, and West Virginia.

The NHDS assigns a code of V27 (“outcome of delivery” included in the CCS category of “normal delivery”) as the principal diagnosis for all women discharged after delivery, regardless of the original principal diagnosis. As a result, the NHDS estimates 3.85 million "normal deliveries" – significantly higher than the NIS estimate. However, the NHDS estimates for the other three pregnancy/delivery classifications were much lower than the NIS estimates.

The “normal delivery” diagnosis category was also responsible for the one ALOS difference. In the NIS, the "normal delivery" category was listed as the principal diagnosis only when coded by the hospital. In contrast, deliveries in the NHDS "normal delivery" category include women who had episiotomies, as well as a variety of minor birth complications. It was not surprising, then, that the average length of stay would be longer for the NHDS "normal" category, as it includes higher risk populations.

Five of the nine significant discharge differences could not be attributed to coding differences. In four categories, the NIS estimates were lower than NHDS estimates (“affective disorders,” “fluid and electrolyte disorders,” “urinary tract infections,” and “asthma”). In the other category (“complication of device, implants, or graft”), the NIS estimate was significantly higher than the NHDS estimate.

In contrast to the discharge and ALOS estimates, however, there were many in-hospital mortality differences; the NIS estimate was significantly higher than the NHDS estimate in nine cases and significantly lower in eight other instances. While four of these differences can be explained by the reordering that occurred for some NHDS discharges, unexplained differences remain for most of the available comparisons.

Comparisons by Procedure Category

Table 16 provides results by procedure category. NIS discharge estimates differed significantly from the NHDS estimates for six of the twenty-five categories ("other procedures to assist delivery,” “diagnostic cardiac catheterization,” “percutaneous coronary angioplasty,” “coronary artery bypass graft,” laminectomy,“ ”and “pacemaker or cardioverter/defibrillator”). In each case, the NIS estimate was significantly higher than the NHDS estimate.

Comparisons of ALOS estimates revealed only one significant difference: the NIS estimate for “other vascular catheterization, not heart” was shorter than the NHDS number. But NIS-NHDS differences were discovered for almost half of the in-hospital mortality comparisons. The NIS mortality estimate was lower than the NHDS statistic for seven procedures and higher than the NHDS estimate for five other procedures.

NIS-MedPAR Comparisons

With the notable exception of discharge counts, NIS estimates of Medicare measures were generally consistent with MedPAR statistics. NIS discharge estimates were uniformly higher than the MedPAR numbers by approximately 21 percent (Table 17). The foremost cause of this discrepancy seems to be the omission of most managed care clients from the MedPAR. While approximately 15.4 percent of Medicare patients were enrolled in managed care programs, managed care discharges constitute only 0.9 percent of MedPAR discharges.

File composition was another contributing factor. While the MedPAR represents actual fee-for-service claims paid by Medicare, the NIS-Medicare sample consists of discharges (both fee-for-service and managed care) for which Medicare was the expected payer (either primary or

secondary). This may explain the higher NIS counts, because the expected payer was not always the actual payer. Finally, a minor factor may be the composition of the NIS. As noted in the discussion of NIS-AHA comparisons, NIS hospitals had more Medicare discharges than the average U.S. community hospital. The difference between NIS and U.S. hospitals, however, was small: approximately one percent.

Because the overall NIS estimate of Medicare discharges exceeds the actual number in the MedPAR data, it was not surprising to find that nearly all the NIS discharge estimates were also significantly higher than the corresponding MedPAR totals. This suggests the need for a more useful comparison of discharges, so we have included a test between proportions of patients in the various categories. And for most comparisons of discharge proportions, few meaningful differences were discovered; proportions were consistent for almost 80 percent of all comparisons.

NIS Medicare estimates were also consistent with MedPAR measures of ALOS, in-hospital mortality rates, and average total hospital charges. Consistency was discovered for:

- More than 83 percent of ALOS comparisons
- More than 85 percent of in-hospital mortality rate comparisons
- Almost 95 percent of average hospital charge comparisons.

Across hospital categories only a handful of meaningful differences were observed. The tables in Appendix C compare NIS Medicare estimates with MedPAR statistics. The following sections refer to these tables.

Overall and Regional Comparisons

Overall, the NIS estimate of Medicare discharges was 21 percent higher than the total number of MedPAR discharges (Table 17). By Census region, all NIS estimates were higher than MedPAR counts, although the difference was not significant for the Midwest. The magnitude of difference was greatest in the Northeast (31 percent higher) and West (39 percent higher), regions with the largest Medicare managed care penetration. When examined from the perspective of proportions (percentage of discharges), significant differences were discovered only in the Midwest (11 percent lower) and West (14 percent higher).

No significant NIS-MedPAR differences, either nationally or regionally, were found for ALOS, in-hospital mortality, or average total hospital charge measures. The similarities of these statistics suggest that no fundamental differences exist between the two databases in their description of patient outcomes.

Comparisons by Hospital Characteristics

Two sets of hospital characteristics were compared for Medicare discharges: first, hospital control and number of beds (categories used in the NHDS comparisons); and second, hospital location, teaching status, and size (NIS stratification variables). While NIS discharge estimates generally exceed MedPAR counts, most other statistics were quite similar between the two databases, including discharge proportions.

By hospital control, or ownership, NIS estimates of Medicare discharges were uniformly higher than MedPAR counts – on the order of 22 to 23 percent (Table 18). However, the percentage of discharges differed only for the category of private, non-profit hospitals (7 percent higher for the NIS). For all other measures (ALOS, in-hospital mortality, and average total charge), the NIS estimates were similar to the MedPAR numbers.

When hospital control was examined by number of beds (Table 18), many NIS discharge estimates were actually in agreement with Medicare counts; significant differences were observed for only six of the 15 discharge comparisons by number of beds. Differences in discharge counts include:

- Public hospitals, 1-99 beds (NIS was 22.5 percent higher)
- Private non-profit hospitals, 1-99 beds (NIS was 25.9 percent higher)
- Private non-profit hospitals, 100-199 beds (NIS was 23.0 percent higher)
- Private non-profit hospitals, 300-499 beds (NIS was 23.7 percent higher)
- Proprietary hospitals, 100-199 beds (NIS was 21.7 percent higher)
- Proprietary hospitals, 300-499 beds (NIS was more than two times higher).

Discharge proportions, however, were similar between the NIS and MedPAR databases. Only two significant differences emerged for the hospital control and bed size comparisons. Both differences occurred for proprietary hospital categories. This may be a result of the NIS make-up:

- The NIS proportion was lower than the MedPAR proportion for hospitals with 200-299 beds. There were 88 MedPAR hospitals in this category (14.8 percent of MedPAR proprietary hospitals), as compared with 14 NIS hospitals (9.5 percent of NIS proprietary hospitals).
- The NIS proportion was higher for hospitals with 300-499 beds. There were 42 MedPAR hospitals in this category (7.1 percent of MedPAR proprietary hospitals), as compared with 14 NIS hospitals (9.5 percent of NIS proprietary hospitals).

ALOS, in-hospital mortality, and average total charge statistics were also quite similar when control was examined across bed size categories. Of the 15 comparisons, few meaningful differences were discovered.

Two significant differences emerged for average length of stay comparisons:

- For private non-profit hospitals with 300-499 beds, the estimated NIS stay was 3.6 percent shorter than the MedPAR average.
- For proprietary hospitals with 1-99 beds, the estimated NIS stay was 22.6 percent longer than the MedPAR average.

Analysis also revealed two differences for in-hospital mortality rates:

- For public hospitals with 1-99 beds, the NIS estimate was 7.4 percent higher than the MedPAR rate.

- For proprietary hospitals with 1-99 beds, the NIS estimate was 17.8 percent higher than the MedPAR rate.

There were two significant differences for average total charge:

- For private non-profit hospitals with 200-299 beds, the NIS estimate was 12.1 percent higher than the MedPAR average.

- For proprietary hospitals with more than 500 beds, the NIS estimate was 9.8 percent lower than the MedPAR average.

A second set of hospital comparisons examines NIS and MedPAR statistics by hospital type, location, and teaching status (Table 19). Most NIS discharge estimates, including statistics for all three hospital types, were significantly higher than the MedPAR counts. However, for discharge proportions, only two substantial differences were discovered. The estimated NIS proportion was 6.2 percent lower than the MedPAR proportion for all rural hospitals, but 18 percent higher for small rural hospitals. Comparisons of other measures also revealed consistency between the NIS and MedPAR databases.

In overall comparisons of location and teaching status, there were no significant differences for the ALOS, in-hospital mortality rates, or average charge measures. Only one meaningful ALOS difference was observed in comparisons by hospital type and size (for small, non-teaching urban hospitals). In addition, one difference for in-hospital mortality rates emerged (for mid-sized rural hospitals). But no significant differences were discovered for average total hospital charges.

Comparisons by Patient Characteristics

Comparisons by patient characteristics revealed significant differences for nearly all discharge count comparisons, as well as most discharge proportions (Table 20). Several differences also emerged in the comparison of in-hospital mortality rates, but nearly all ALOS and average total charge evaluations were consistent between the NIS and MedPAR.

NIS estimates of discharges for whites and blacks were actually lower than MedPAR counts. And unlike comparison by hospital characteristics, discharge proportion differences surfaced for most patient categories of race and age. The NIS and MedPAR present different mixes of patient characteristics:

- One of every four NIS Medicare discharges lacks race information, while more than 99 percent of MedPAR discharges include race information.

- Where race information was available, the NIS, compared with the MedPAR, includes more patients in the “other” category and fewer patients in the “white” category.

- Of discharges with race information, the proportion of discharges with “other” race in the NIS was more than twice the percentage in the MedPAR (nine percent vs. four percent).

This finding was likely a result of the NIS' geographic composition: the NIS includes the most racially diverse states in the nation (New York and California) and excludes many of the least racially and ethnically diverse states (such as North Dakota).

Relative to MedPAR numbers, the NIS tends to overestimate patients between 65 and 84 years of age (the age group responsible for approximately two-thirds of Medicare inpatient discharges) and to underestimate patients younger than 65 and older than 85. Comparing the percentage of discharges in each age group, the NIS overestimates the 65-74 age group by 2.1 percent and the 75-84 age group by 3.8 percent. On the other hand, the NIS underestimates the 0-64 group by 8.5 percent and the 85+ age group by 3.6 percent. There were no differences between the NIS and MedPAR when comparing genders for percentages of discharges, ALOS, in-hospital mortality, and average total charges.

ALOS estimates were generally in agreement between the two databases; in nearly every category, no meaningful differences emerged between the NIS and MedPAR numbers. The NIS estimate was lower than the MedPAR average where race was unknown.

Significant differences were observed for one-half of the race and age group comparisons of in-hospital mortality rates. NIS estimates for "other" race and "unknown race," as well as for patients 75-84 years of age, were higher than the corresponding MedPAR statistic. For patients 65-74 years of age, the NIS estimate was lower than the MedPAR rate. Relative in-hospital mortality rate differences were:

- Age 65-74 years – 2.6 percent lower
- Age 75-84 years – 3.3 percent higher.

Comparisons by DRG

In comparisons of diagnosis related group (DRG) categories (Table 21), most NIS estimates, with the exception of discharge counts, were consistent with corresponding MedPAR statistics. However, significant differences were found for all 25 DRG comparisons of discharge counts. The NIS estimate was higher than the MedPAR count in every case, ranging from 12 percent higher ("psychosis") to 29 percent higher ("rehabilitation"). The median difference in number of discharges was 22 percent.

For DRG comparisons of discharge proportions, ALOS, in-hospital mortality, and average hospital charge, NIS and MedPAR statistics were quite similar. Differences for these measures include:

- Three significant differences for discharge percentages – the NIS estimate was lower in each case, ranging from 3.0 percent lower ("hip & femur procedures except major joint") to 3.8 percent lower ("kidney & urinary tract infections with complicating conditions").
- For ALOS comparisons, there were five significant differences: the estimated NIS stay was shorter in each instance. Differences ranged from 1.5 percent ("G.I. hemorrhage with complicating conditions") to 3.4 percent ("chest pain").
- For in-hospital mortality rate comparisons, three significant differences emerged. The NIS estimate for "chest pain" was 23 percent lower, while NIS estimates were higher

than the corresponding MedPAR statistics for “chronic obstructive pulmonary disease” (7.6 percent) and “rehabilitation” (nearly three times higher).

- Three significant differences for average hospital charge. The NIS estimate was higher in each case, ranging from 4.0 percent to 6.3 percent higher (“hip & femur procedures except major joint” and “chronic obstructive pulmonary disease,” respectively).

For most DRGs, significant differences were observed only for discharge counts. If other discrepancies arose, inconsistencies were generally limited to only one outcome. However, there were three exceptions:

- Comparisons for “chronic obstructive pulmonary disease” revealed dissimilarities for three measures (in addition to the difference for discharge counts). Compared with MedPAR statistics: 1) the estimated NIS proportion was 3.1 percent lower; 2) the NIS in-hospital mortality rate estimate was 7.6 percent higher; and 3) the NIS average hospital charge estimate was 6.3 percent higher.

- NIS estimates of ALOS for “chest pain” were 3.4 percent lower than MedPAR estimates, while NIS estimates for in-hospital mortality were 23.1 percent lower.

- Comparisons for “hip & femur procedures except major joint” suggested two inconsistencies (in addition to the difference for discharge counts). Compared with MedPAR statistics: 1) the estimated NIS proportion was 3.0 percent lower and 2) the NIS average hospital charge estimate was 4.0 percent higher.

Comparisons by Diagnosis Category

Significant differences were observed between NIS estimates of Medicare discharges and MedPAR discharges by count for 24 of the 25 principal diagnosis categories (Table 22). These differences ranged from 15 percent higher to 29 percent higher (“affective disorders” and “rehabilitation care, fitting of prostheses,” respectively). The median difference was 21 percent.

Comparisons for other measures indicated a high degree of consistency between the NIS and MedPAR statistics. The 25 diagnosis category comparisons revealed only a handful of significant differences for any other measure (discharge proportions, ALOS, in-hospital mortality rates, and total charges):

- There were only four significant differences in discharge proportions. In each of the four instances, the NIS estimate was lower than the MedPAR percentage, ranging from 3.1 percent lower (“urinary tract infections”) to 5.1 percent lower (“spondylosis intervertebral disc disorders and other back problems”).

- Six ALOS differences were observed, with the estimated NIS stays significantly shorter than the MedPAR averages in each case, although the absolute discrepancies were relatively small. Differences ranged from 2.0 percent shorter for “fluid and electrolyte disorders” to 2.8 percent shorter for “non-specific chest pain.”

- For in-hospital mortality rate comparisons, five significant differences occurred. There were two categories in which the NIS estimate was higher (“chronic obstructive pulmonary disease and bronchiectasis” and “rehabilitation care, fitting of prostheses”), and three cases in which the NIS estimate was lower (“congestive heart failure, non-

hypertensive," "non-specific chest pain," and "fracture of neck of femur/hip"). The differences ranged from 23.1 percent lower to 7.4 percent higher, except for "rehabilitation care" which reflected a mortality rate 2.6 times higher in the NIS than in MedPAR data.

- Average total hospital charge comparisons illustrated a high level of agreement; only one difference was observed. For the category "chronic obstructive pulmonary disease and bronchiectasis," the estimated NIS average charge was 5.3 percent higher than the MedPAR average.

Comparisons for most diagnosis categories revealed discrepancies only on discharge counts. When other differences were observed, inconsistency was generally limited to one other measure. There were, however, two exceptions:

- Comparisons for "chronic obstructive pulmonary disease and bronchiectasis" revealed three significant differences (in addition to the difference for discharge counts). Compared with MedPAR statistics: 1) the estimated NIS discharge percentage was 3.8 percent lower; 2) the NIS in-hospital mortality rate estimate was 7.4 percent higher; and 3) the NIS estimate of average hospital charges was 5.3 percent higher. (These results were similar to the comparisons for the DRG category "chronic obstructive pulmonary disease.")

- Two inconsistencies (in addition to the difference for discharge counts) were observed in comparisons for "nonspecific chest pain." Compared with MedPAR statistics: 1) the NIS ALOS estimate was 2.8 percent longer, and 2) the NIS in-hospital mortality rate estimate was 23.1 percent lower.

Comparisons by Procedure Category

In contrast to the diagnosis and DRG evaluations, comparisons by procedure groups revealed greater variability in discharge count comparisons (Table 23). The range in differences was wider than that observed for diagnosis or DRG categories. All but three NIS discharge estimates by procedure exceeded the corresponding MedPAR total; the median difference was 20 percent. NIS discharge estimates were higher than MedPAR counts, ranging from 13 percent higher ("laminectomy, excision of intervertebral disc") to 39 percent higher ("physical therapy, exercises, manipulation").

For the majority of other measures, the NIS estimates were consistent with MedPAR statistics. Only a handful of differences were observed across the 25 most frequent procedure categories:

- There were four procedure categories in which the NIS estimates of discharge proportions were significantly different from the MedPAR statistic. The NIS estimate ranged from 3.6 percent lower than the MedPAR proportion ("treatment, fracture, or dislocation of hip and femur") to 8.5 percent lower ("laminectomy, excision intervertebral disc").

- For ALOS comparisons, six differences were statistically meaningful. The NIS estimated stay for “hemodialysis” was 3.1 percent longer than the MedPAR average, but the NIS estimates were shorter in duration for the other five differences. These differences ranged from 2.0 percent to 6.9 percent shorter (“upper GI endoscopy, biopsy” and “computerized axial tomography scan head,” respectively).

- Only two significant differences emerged when comparing in-hospital mortality rates. The estimated NIS rate was 6.6 percent lower than the MedPAR rate for “treatment, fracture, or dislocation of hip and femur,” but 65 percent higher for “physical therapy exercises, manipulation, and other procedures.” The differences found for this latter treatment appear large, but the mortality rates were very low; the MedPAR in-hospital mortality rate was 0.52 percent and the NIS estimated rate was 0.86 percent.

All NIS average hospital charge estimates were consistent with MedPAR averages.

Finally, only two procedure categories revealed more than one significant difference among the outcome measurements: discharge proportion, ALOS, in-hospital mortality rate, and average total hospital charge. These categories included:

- The category “treatment, fracture, or dislocation of hip and femur,” in which two meaningful differences were observed. Compared with MedPAR statistics: 1) the estimated NIS discharge percentage was 3.6 percent lower, and 2) the NIS in-hospital mortality rate estimate was 6.6 percent lower.

- Comparisons for the procedure grouped as “hemodialysis” revealed two inconsistencies. Compared with MedPAR statistics: 1) the NIS estimated discharge percentage was 7.5 percent lower, and 2) the NIS ALOS estimate was 3.1 percent longer in duration.

DISCUSSION

These results indicate that estimates from the 2001 NIS were generally in line with statistics from the 2001 NHDS and the 2001 MedPAR. Most NIS estimates were consistent with NHDS estimates for discharges, average length of stay, and in-hospital mortality rates. Nearly all of the average length of stay and most in-hospital mortality rate estimates were consistent between the two samples. Differences occurred primarily when comparing estimates for specific diagnosis or procedure groups. A critical difference between the 2001 NIS and 2001 NHDS data was that the NHDS reordered some diagnosis codes (in an effort to achieve more consistency within that sample). As a result of these coding alterations, some significant differences appear in the findings related to diagnosis categories.

While most NIS estimates were consistent with MedPAR statistics, NIS estimates of Medicare discharge counts were 21 percent higher than MedPAR estimates. The primary reason for this difference was the absence of most managed care discharges from the MedPAR data. This discrepancy was exaggerated because the NIS was drawn from states that have higher managed care penetration than the national average. Finally, most average length of stay, in-hospital mortality and average total charge estimates from the NIS were consistent with the corresponding MedPAR statistics.

The key difference between the NIS and the databases with which it was compared is geographic. Both the NHDS and the MedPAR are national in coverage; MedPAR data include all Medicare paid, fee-for-service discharges in the U.S., while NHDS data were gathered from a sampling frame of all 50 states plus the District of Columbia. In contrast, the 2001 NIS was drawn from the 33 states (as shown in Table 1); these states comprise more than 81 percent of all U.S. community hospital discharges. This difference may be a factor for researchers in cases where comprehensive geographic representation is important. Some significant differences between the states excluded and included in the NIS may offer explanations for several of the observed differences.

NIS states are disproportionately the more populous states. NIS states had an average population density of 124.5 persons per square mile in 2001, as compared with a national average of 80.6 persons per square mile. The average population density of non-NIS states was 28.8 persons per square mile. Of the ten states with the highest population density, all but two were included in the NIS. These states, and their rank in terms of population density order, are: New Jersey (1), Rhode Island (2), Massachusetts (3), Connecticut (4), Maryland (5), New York (7), Florida (8), and Pennsylvania (10). At the other end of the spectrum, only two of the ten least populous states were included in the NIS: Utah (41) and Nebraska (42).[4] Given this difference in geographic sampling, the NIS sampling frame starts with few hospitals in sparsely populated areas. Even weighting the discharges from rural states does not adequately account for the remote areas of the country, which include a disproportionate number of the smallest hospitals. The most rural state included in the sample, Nebraska, has a population density of 22.4 persons per square mile, compared with population densities of 1.1 for Alaska, 5.1 for Wyoming, and 6.2 for Montana.[5]

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[4]Source of state rankings: *State and Metropolitan Area Data Book - 5th Edition* and 2000 U.S. Census.
[5]None of these three states had all-payer hospital discharge data for the 2001 data year, so none were eligible for HCUP inclusion.

One impact of the specific subset of states selected for the NIS was an over representation of Medicare patients in managed care. In the 33 states included in the 2001 NIS, the market penetration of managed care providers for Medicare enrollees averaged 16.6 percent. In contrast, for the 17 states not included in the NIS, the mean market penetration of managed care providers was only 9.4 percent. Table 6 examines managed care penetration by region of NIS and non-NIS states. For 2001, Medicare managed care market penetration in the Northeast, South, and West regions was higher in NIS states than in non-NIS states; the greatest penetration discrepancies were observed in the West and Northeast[6]. These were also the regions with the largest difference between MedPAR discharges and NIS estimates. This finding was consistent with the hypothesis that the MedPAR under represents total discharges by omitting most managed care discharges.[7]

Table 6. Medicare Managed Care Market Penetration by Region

	Non-NIS States		NIS States		All States in Region	
	Mean	N	Mean	N	Mean	N
Northeast	0.8%	1	18.2%	8	17.9%	9
South	7.6%	6	10.0%	10	9.6%	16
Midwest	10.0%	4	8.2%	8	8.8%	12
West	14.2%	6	33.5%	7	31.2%	13

This exclusion by MedPAR was inconsequential in those areas with minimal market penetration by managed care providers, but greater for regions, particularly the West, in which managed care participation by Medicare patients was higher. Because the NIS includes discharges for all Medicare managed care patients and not just the fee-for-service discharges, it may be preferable to the MedPAR file for estimating the total Medicare discharges.

NIS Strengths

While the previous discussion focused on differences between the NIS and other data sources, it should be noted that these differences are only of concern when there is a reason to expect that geographic region might relate to the variable of interest. We must emphasize that the NIS provides a large sample size that tends to yield estimates with much smaller standard errors than does a sample such as the NHDS. Without a sample of several million, as provided by the NIS, estimates for less common procedures and diagnoses are unreliable. While the NIS may overemphasize urbanized areas, this emphasis on higher density states makes data available on atypical conditions that might rarely find inclusion in a smaller sample.

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[6]The NIS includes all Northeast states except New Hampshire.
[7]Source: *Medicare Managed Care Market Penetration for All Medicare Plan Contractors - Quarterly State/County Data Files, June 2001* (http://www.cms.hhs.gov/healthplans/statistics/mpsct/mpsc0601.zip).

NIS discharge estimates were quite similar to numbers from the AHA, regardless of the hospital characteristics. NIS estimates were generally in line with NHDS estimates as well. When estimating ALOS and in-hospital mortality for the nation, or within any major categories, the NIS rates were consistent with the NHDS data. Because NIS estimates have greater precision – a result of the large sample size – it may be preferred for certain analyses based on relatively uncommon conditions. Furthermore, the NIS contains total hospital charges, while the NHDS does not. For analysis involving charges on all payers, the NIS is the only choice.

The NIS provides a large sample of Medicare discharges both in managed care and fee-for-service plans; it would therefore be the choice of researchers who wished to include all discharges regardless of payment type. Inclusion of Medicare managed care discharges leads to discrepancies in estimated discharge counts, but most other NIS Medicare estimates were similar to MedPAR statistics, particularly in comparisons by hospital characteristics.

NIS Weaknesses

NIS discharge estimates vary from NHDS estimates by hospital size; the NIS includes more discharges from large hospitals more than does the NHDS, although NIS discharge estimates were close to AHA survey results. Because the NHDS uses a more geographically complete sampling frame, however, it might be preferable for researchers in certain cases.

The NIS also contains significant numbers of discharges for which race was missing (26 percent). While the NHDS also suffers from this problem (23 percent of discharges without race), the MedPAR includes an insignificant number of discharges without race information.

Because of the states available for the sample, the NIS exaggerates the discrepancy between total Medicare discharges and the MedPAR's primarily fee-for-service population. The MedPAR database provides no estimate for managed care participants, while the NIS database may overestimate the number of discharges in managed care.

Contrasting Findings from the 2000 and 2001 NIS Comparisons

NIS-NHDS Evaluations

Estimates of most outcome measurements from the 2001 NIS and NHDS data were consistent; this finding was similar to evaluations in previous years. Overall, the discharge and ALOS estimates from the two databases were similar for both years. NIS and NHDS estimates of ALOS were almost indistinguishable; there were few significant ALOS differences in either 2000 or 2001. More than 80 comparisons were made for each year of data: only four differences emerged for the 2000 data and only two significant differences emerged for the 2001 data. NIS and NHDS discharge estimates from 2001 and 2000 data were also similar, although for both years the data sources generate divergent statistics for large and small hospitals.

In-hospital mortality rate estimates for 2001 data were more consistent than the 2000 data across both hospital and patient categories, although 2001 comparisons revealed more discrepancies for the diagnosis and procedure classifications. Of all hospital comparisons, one significant mortality difference was observed, and a single meaningful mortality rate difference was discovered for patient categories as well. Both outcomes were improvements over 2000 assessments. For diagnosis and procedure comparisons, the 2001 evaluations revealed more

differences than in previous years. No trend appears with these differences, however. Categories with lower NIS rates were as prevalent as those with higher NIS rates.

Differences in In-hospital mortality rate conflicts may be related to differences in the hospitals included in the two samples. The NIS tends to have better representation from larger hospitals. The NIS better captures less common diagnoses which tend to have higher mortality rates[8]. In addition, because the NIS retains all discharges from a hospital, it was not possible to exclude some of the higher mortality cases that might have been treated in skilled-nursing facilities and other long-term care units within the hospital. There may also be differences with regard to a hospital's teaching status or location, although this cannot be verified because the NHDS does not report hospital teaching status or urban/rural information.

NIS-MedPAR Evaluations

As discussed earlier in this report, NIS Medicare discharge estimates were higher – overall, and for almost all categories – than MedPAR counts. Inconsistencies were noted for nearly all discharge counts. The overall discrepancy was 21 percent. This was also true for earlier years: the difference in 2000 was 22 percent and in 1999 it was 12 percent. The growth from 1999 to 2000 may have been caused by increases in Medicare managed care market penetration, particularly within NIS states.

While there were differences for discharge statistics, other estimates were similar between the two data sources. Most NIS estimates of discharge proportions, ALOS, in-hospital mortality rates, and average total hospital charge were comparable to MedPAR statistics. Mortality rates were quite similar in both years. Comparisons for 2001 data, however, did reflect improvement for most of these measures over prior years. In particular, estimates of discharge proportions improved in 2001, largely because diagnosis and procedure comparisons were more consistent.

ALOS comparisons were greatly improved as well. The overall NIS Medicare estimate of ALOS in 2000 was significantly shorter in duration than the MedPAR average. For the 2001 data, this was no longer the case; the NIS and MedPAR ALOS statistics were consistent. And ALOS evaluations for hospital and patient categories were also more consistent for 2001. Finally, average hospital charge comparisons revealed few differences in either 2001 or 2000.

Conclusion

Each of the data sources discussed has its strengths and weaknesses, and each may be the preferred choice for different research questions. The NIS offers a large sample that enables study of low incidence disorders and less common procedures; NIS estimates can be calculated for literally thousands of special sub-populations that may be of interest to researchers. In addition, NIS hospitals accurately reflect the universe of U.S. hospitals, particularly the relative mix of large and small hospitals. So the NIS may be more appropriate when hospital type and size is an important consideration.

The NHDS and MedPAR, however, both offer data drawn from all 50 states, rather than the 33 states that make up the NIS. Where a comprehensive geographic representation is more

[8]The average in-hospital mortality rate for discharges with the 50 most frequent diagnosis groups was 2.1 percent. This compares to an average of 4.8 percent for discharges with one of the 50 least frequently found diagnosis groups.

important than a large sample size, and the question under study requires all age groups, the NHDS might be preferable. In the same situation, if only Medicare clients are of interest, the MedPAR data set might be preferable.

The NIS is not without bias. It does, however, provide a useful data source for answering many research questions. The source of the few differences that do exist between the NIS and NHDS are areas that warrant further investigation. The relationship between hospital size and treatment patterns is an example.

As for which of the data sources discussed is preferable or better, the answer depends on the needs of the researcher. The intended use of the data is the most critical factor in determining which data source will be most valuable. In general, the NIS estimates of variables essential to health care policy – including in-hospital mortality, inpatient population size, length of stay, and costs – are accurate and precise. Statistics can be calculated for large groups ranging from the inpatient population of the United States, as well as for small subsets featuring specific conditions. The characteristics documented in this report suggest that the 2001 NIS is a valuable tool for researchers and policy makers alike.

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APPENDIX A: NIS-AHA TABLES

Table 7. Number of Hospitals in NIS Frame and Universe, 2001

	Hospital Counts		
	2001 AHA Universe	2001 NIS Frame[1] (Weighted)	2001 NIS Frame[1] (Unweighted)
U.S.	4,812	4,812	986
Region			
Northeast	668	668	136
Midwest	1,392	1,392	284
South	1,848	1,848	379
West	904	904	187
Hospital Control			
Public	1,158	1,140	235
Private, Non-Profit	2,953	2,956	604
Proprietary	701	717	147
Location / Teaching Status			
Rural Hospitals	2,169	2,169	443
Urban, Non-Teaching	1,842	1,842	378
Urban, Teaching	801	801	165

Note: Significance tests were not performed because AHA numbers were not sample statistics.

[1]The 2001 frame contains 33 states.

Table 8. NIS Sampling Frame and AHA Universe Comparisons, 2001

	Mean Hospital Values		Median Hospital Values	
	Universe	NIS Frame[1]	Universe	NIS Frame[1]
Hospital Admissions	6,930.91	7,029.04	3,747.00	3,914.50
Hospital Discharges	6,930.91	7,029.04	3,747.00	3,914.50
Hospital Discharges[2]	7,740.09	7,853.47	4,190.00	4,380.00
Hospital Beds	154.71	153.03	98.00	95.50
Occupancy Rate	0.50	0.51	0.52	0.52
Average Length of Stay	5.39	5.02	4.42	4.31
Average Length of Stay[2]	4.99	4.63	4.03	3.95
Births	809.18	824.43	322.00	320.50
Inpatient Surgeries	2,043.02	2,076.17	1,004.00	1,102.50
Total Hosp. Expenses [dollars]	79,118,593	80,483,684	35,598,000	39,185,347
Hosp. Expenses/Bed [dollars]	438,905	472,035	402,899	426,840
Total Hospital Payroll [dollars]	32,933,440	33,482,377	14,873,715	16,032,074
Hosp. Payroll per Bed [dollars]	182,638	195,357	165,590	176,007
Percent Medicare Days	53.34	54.28	53.94	54.96
Percent Medicare Discharges	47.48	47.99	47.56	47.84
Percent Medicare Discharges[2]	43.99	44.47	42.75	43.59
Percent Medicaid Days	14.01	14.18	11.94	12.12
Percent Medicaid Discharges	14.70	14.84	13.88	13.88
Percent Medicaid Discharges[2]	13.29	13.39	12.49	12.43
FTE[3]	823.00	823.03	406.50	426.75
FTE[3] per Bed	4.96	5.21	4.55	4.78

Note: Significance tests were not performed because AHA numbers were not sample statistics.

[1]The 2001 frame contains 33 states.

[2]Adjusted for well newborns.

[3]Full-time equivalents.

Table 9. NIS and AHA Comparisons Overall and by Region, 2001

	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)	
	NIS	**AHA**	**NIS**	**AHA**
Overall	37,187 (593)	37,671	4.63 (0.03)	4.52**
Region				
Northeast	7,408 (264)	7,407	5.33 (0.11)	5.25
Midwest	8,658 (248)	8,658	4.43 (0.06)	4.35
South	14,129 (393)	14,129	4.58 (0.05)	4.47*
West	6,990 (257)	6,990	4.23 (0.08)	4.08

Note: AHA discharges and length of stays were adjusted for well newborns.

**Significant at a 5 percent level.*

***Significant at a 1 percent level.*

Table 10. NIS and AHA Comparisons by Hospital Control, 2001

Hospital Control	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)	
	NIS	AHA	NIS	AHA
Public				
Total	4,704 (472)	5,127	4.63 (0.13)	4.73
1-99 Beds	1,098 (63)	1,149	3.64 (0.06)	3.94**
100-199 Beds	917 (116)	1,044	4.16 (0.11)	4.29
200-299 Beds	714 (199)	606	4.72 (0.20)	4.55
300-499 Beds	1,262 (290)	1,108	5.11 (0.21)	5.32
500+ Beds	710 (245)	1,218*	5.86 (0.56)	5.41
Private Non-Profit				
Total	27,640 (800)	27,469	4.64 (0.04)	4.49**
1-99 Beds	2,876 (149)	2,665	3.75 (0.08)	3.81
100-199 Beds	5,234 (312)	5,178	4.47 (0.08)	4.14**
200-299 Beds	5,307 (466)	5,303	4.72 (0.08)	4.46**
300-499 Beds	8,388 (709)	7,865	4.59 (0.07)	4.54
500+ Beds	5,833 (688)	6,458	5.21 (0.12)	5.03

Hospital Control	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)	
	NIS	AHA	NIS	AHA
Proprietary				
Total	4,842 (355)	4,589	4.57 (0.09)	4.45
1-99 Beds	691 (71)	637	4.18 (0.26)	3.91
100-199 Beds	1,706 (128)	1,670	4.28 (0.13)	4.16
200-299 Beds	830 (145)	1,088	4.88 (0.20)	4.54
300-499 Beds	1,198 (204)	785*	4.71 (0.10)	4.67
500+ Beds	416 (114)	406	5.36 (0.33)	5.83

Note: AHA discharges and length of stays were adjusted for well newborns.

**Significant at a 5 percent level.*

***Significant at a 1 percent level.*

Table 11. NIS and AHA Comparisons by Hospital Characteristics, 2001

	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)	
	NIS	AHA	NIS	AHA
Location / Teaching Status				
Rural – Total	5,800 (214)	5,800	3.92 (0.05)	4.13**
1-49 beds	1,253 (60)	1,248	3.53 (0.12)	3.77
50-99 beds	1,781 (136)	1,595	3.66 (0.04)	3.88**
100+ beds	2,765 (255)	2,956	4.27 (0.08)	4.41
Urban, Non-Teaching – Total	15,269 (373)	15,268	4.50 (0.05)	4.33**
1-99 beds	1,595 (116)	1,511	4.09 (0.16)	3.84
100-199 beds	4,793 (249)	4,954	4.41 (0.08)	4.10**
200+ beds	8,880 (390)	8,802	4.63 (0.06)	4.54
Urban, Teaching – Total	16,117 (408)	16,117	5.00 (0.06)	4.85*
1-299 beds	2,532 (307)	2,339	4.83 (0.12)	4.49**
300-499 beds	4,705 (540)	4,429	4.83 (0.11)	4.73
500+ beds	8,879 (658)	9,348	5.14 (0.10)	4.99

Note: AHA discharges and length of stays were adjusted for well newborns.

**Significant at a 5 percent level.*

***Significant at a 1 percent level.*

APPENDIX B: NIS-NHDS TABLES

Table 12. NIS and NHDS Comparisons Overall and by Region, 2001

	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)	
	NIS	**NHDS**	**NIS**	**NHDS**	**NIS**	**NHDS**
United States	37,187 (593)	36,311 (1,470)	4.61 (0.03)	4.69 (0.30)	2.31 (0.03)	2.24 (0.12)
Region						
Northeast	7,408 (264)	7,788 (632)	5.30 (0.11)	5.40[1] (c)	2.54 (0.08)	2.38 (0.27)
Midwest	8,658 (248)	8,206 (788)	4.41 (0.06)	4.17[1] (c)	2.11 (0.05)	2.13 (0.28)
South	14,129 (393)	14,138 (721)	4.56 (0.05)	4.76 (0.39)	2.41 (0.05)	2.31 (0.16)
West	6,990 (257)	6,177 (498)	4.21 (0.08)	4.34 (0.54)	2.12 (0.09)	2.07 (0.23)

**Significant at a 5 percent level.*

***Significant at a 1 percent level.*

[1]A significance test was not performed because a valid standard error was not available.

(a) Because of a limited sample, the NHDS estimate and standard error were unreliable and not reported.

(b) The NHDS estimate was reported but was not considered reliable; the standard error was not reported.

(c) A valid standard error could not be calculated.

Table 13. NIS and NHDS Comparisons by Hospital Control and Size, 2001

Hospital Control/Size	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)	
	NIS	NHDS	NIS	NHDS	NIS	NHDS
Total Public	4,704 (472)	4,585 (189)	4.61 (0.13)	4.67 (0.30)	2.28 (0.06)	2.19 (0.12)
1-99 Beds	1,098 (63)	1,414** (61)	3.61 (0.06)	3.42 (0.23)	2.44 (0.08)	2.23 (0.13)
100-199 Beds	917 (116)	955 (42)	4.14 (0.11)	4.39 (0.30)	2.29 (0.12)	2.16 (0.13)
200-299 Beds	714 (199)	358 (18)	4.70 (0.20)	4.51 (0.34)	2.05 (0.25)	1.71 (0.12)
300-499 Beds	1,262 (290)	1,155 (50)	5.09 (0.21)	5.60 (0.37)	2.26 (0.12)	2.24 (0.13)
500+ Beds	710 (245)	701 (32)	5.84 (0.56)	6.11 (0.42)	2.30 (0.18)	2.30 (0.15)
Total Private Non-Profit	27,640 (800)	27,354 (1,109)	4.61 (0.04)	4.67 (0.29)	2.33 (0.04)	2.25 (0.12)
1-99 Beds	2,876 (149)	5,251** (216)	3.72 (0.08)	4.04 (0.26)	2.28 (0.13)	1.96 (0.11)
100-199 Beds	5,234 (312)	7,884** (322)	4.45 (0.08)	4.59 (0.29)	2.38 (0.08)	2.36 (0.13)
200-299 Beds	5,307 (466)	4,971 (205)	4.70 (0.08)	4.75 (0.30)	2.30 (0.08)	2.20 (0.12)
300-499 Beds	8,388 (709)	6,139** (252)	4.57 (0.07)	4.86 (0.31)	2.31 (0.07)	2.23 (0.13)
500+ Beds	5,833 (688)	3,106** (129)	5.19 (0.12)	5.43 (0.35)	2.34 (0.11)	2.55 (0.15)

Hospital Control/Size	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)	
	NIS	NHDS	NIS	NHDS	NIS	NHDS
Total Proprietary	4,842 (355)	4,371 (180)	4.55 (0.09)	4.86 (0.31)	2.26 (0.08)	2.28 (0.13)
1-99 Beds	691 (71)	1,345** (58)	4.16 (0.26)	4.90 (0.33)	2.05 (0.17)	1.44** (0.08)
100-199 Beds	1,706 (128)	1,625 (69)	4.26 (0.13)	4.88 (0.32)	2.21 (0.09)	2.95** (0.17)
200-299 Beds	830 (145)	743 (34)	4.86 (0.20)	4.94 (0.34)	2.37 (0.11)	2.53 (0.16)
300-499 Beds	1,198 (204)	657** (30)	4.69 (0.09)	4.65 (0.33)	2.29 (0.24)	2.10 (0.13)
500+ Beds	416 (114)	0[1] (a)	5.35 (0.33)	0.00[1] (a)	2.55 (0.39)	0.00[1] (a)

**Significant at a 5 percent level.*

***Significant at a 1 percent level.*

[1]A significance test was not performed because a valid standard error was not available.

(a) Because of a limited sample, the NHDS estimate and standard error were unreliable and not reported.

(b) The NHDS estimate was reported but was not considered reliable; the standard error was not reported.

(c) A valid standard error could not be calculated.

Table 14. NIS and NHDS Comparisons by Patient Characteristics, 2001

	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)	
	NIS	NHDS	NIS	NHDS	NIS	NHDS
Age Group						
0-15 Years	5,968 (206)	6,386 (262)	3.44 (0.07)	3.77 (0.24)	0.37 (0.02)	0.50** (0.02)
16-44 Years	10,225 (211)	10,174 (415)	3.56 (0.04)	3.67 (0.23)	0.44 (0.01)	0.39 (0.02)
45-64 Years	7,674 (143)	7,224 (296)	4.89 (0.04)	5.01 (0.32)	1.99 (0.03)	2.07 (0.11)
65+ Years	13,316 (266)	12,525 (510)	5.77 (0.04)	5.81 (0.37)	4.81 (0.05)	4.74 (0.27)
Unknown	2 (0)	0[1] (a)	4.86 (0.93)	0.00[1] (a)	0.88 (0.45)	0.00[1] (a)
Gender						
Female	21,984 (369)	21,593 (876)	4.40 (0.03)	4.48 (0.28)	1.99 (0.03)	1.97 (0.11)
Male	15,197 (243)	14,717 (598)	4.90 (0.04)	5.01 (0.32)	2.77 (0.03)	2.65 (0.15)
Unknown	5 (1)	0[1] (a)	4.14 (0.38)	0.00[1] (a)	1.36 (0.69)	0.00[1] (a)
Race						
White	18,998 (681)	22,351* (1,271)	4.73 (0.04)	4.68 (0.40)	2.63 (0.04)	2.36 (0.19)
Black	3,553 (245)	4,333 (313)	5.33 (0.10)	5.40 (0.62)	2.17 (0.05)	1.91 (0.19)
Other	4,823 (312)	1,429** (202)	4.27 (0.08)	4.74[1] (c)	1.53 (0.05)	2.82[1] (c)
Unknown	9,812 (701)	8,195 (1,212)	4.26 (0.06)	4.35[1] (c)	2.13 (0.04)	2.00[1] (c)

	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)	
	NIS	NHDS	NIS	NHDS	NIS	NHDS
Principal Payer						
Medicare	13,727 (269)	12,685 (560)	5.84 (0.04)	5.93 (0.42)	4.37 (0.04)	4.34 (0.27)
Medicaid	6,378 (245)	5,915 (425)	4.26 (0.07)	4.51 (0.53)	0.99 (0.04)	1.02 (0.10)
Private Insurance	14,124 (409)	14,145 (968)	3.70 (0.03)	3.80 (0.40)	1.08 (0.03)	1.05 (0.10)
Self Pay	1,676 (137)	1,613 (77)	3.81 (0.10)	3.88 (0.34)	1.38 (0.05)	1.41 (0.09)
No Charge	102 (34)	116 (21)	4.67 (0.21)	4.86[1] (c)	1.50 (0.17)	1.43[1] (c)
Other	1,082 (84)	1,834* (326)	4.08 (0.09)	4.32[1] (c)	1.68 (0.13)	1.73[1] (c)
Missing	30 (8)	0[1] (a)	4.27 (0.37)	0.00[1] (a)	1.66 (0.50)	0.00[1] (a)

**Significant at a 5 percent level.*

***Significant at a 1 percent level.*

[1]A significance test was not performed because a valid standard error was not available.

(a) Because of a limited sample, the NHDS estimate and standard error were unreliable and not reported.

(b) The NHDS estimate was reported but was not considered reliable; the standard error was not reported.

(c) A valid standard error could not be calculated.

Table 15. NIS and NHDS Comparisons by Principal Diagnosis Category, 2001

Principal Diagnosis	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)	
	NIS	NHDS	NIS	NHDS	NIS	NHDS
218: Liveborn	3,999 (129)	3,668 (152)	3.01 (0.05)	3.27 (0.21)	0.30 (0.01)	0.36* (0.02)
101: Coronary atherosclerosis and other heart disease	1,400 (58)	1,255 (55)	3.63 (0.05)	3.35 (0.22)	0.75 (0.02)	0.68 (0.04)
122: Pneumonia (except that caused by tuberculosis or sexually transmitted disease)	1,222 (19)	1,317 (57)	5.88 (0.04)	5.74 (0.38)	5.83 (0.09)	5.41 (0.32)
108: Congestive heart failure, nonhypertensive	1,049 (21)	1,023 (45)	5.57 (0.04)	5.45 (0.37)	4.59 (0.08)	4.04* (0.24)
102: Nonspecific chest pain	875 (25)	63** (5)	1.79 (0.01)	1.29[1] (c)	0.05 (0.00)	0.00** (0.00)
100: Acute myocardial infarction	773 (24)	794 (36)	5.40 (0.06)	5.74 (0.39)	8.12 (0.12)	9.92** (0.61)
193: Trauma to perineum and vulva	763 (28)	--[1] (a)	1.96 (0.01)	--[1] (a)	0.00 (0.00)	--[1] (a)
69: Affective disorders	708 (39)	949** (42)	7.57 (0.16)	7.48 (0.51)	0.05 (0.00)	0.11** (0.00)
106: Cardiac dysrhythmias	704 (18)	707 (32)	3.52 (0.03)	3.52 (0.25)	1.21 (0.03)	1.37 (0.08)
195: Other complications of birth, puerperium affecting management of mother	641 (24)	52** (4)	2.55 (0.02)	2.89[1] (c)	0.03 (0.00)	0.07** (0.00)
205: Spondylosis, intervertebral disc disorders, other back problems	639 (22)	573 (27)	3.10 (0.03)	3.25 (0.23)	0.18 (0.01)	0.12** (0.00)
127: Chronic obstructive pulmonary disease and bronchiectasis	603 (11)	661 (30)	5.21 (0.04)	4.89 (0.34)	2.81 (0.07)	2.82 (0.17)
237: Complication of device, implant or graft	577 (18)	496** (24)	5.69 (0.07)	6.04 (0.43)	2.00 (0.06)	1.99 (0.12)
109: Acute cerebrovascular disease	576 (11)	537 (25)	6.53 (0.07)	6.54 (0.46)	11.03 (0.17)	10.31 (0.65)
55: Fluid and electrolyte disorders	569 (10)	721** (33)	4.02 (0.04)	3.81 (0.27)	2.84 (0.07)	2.06** (0.12)

Principal Diagnosis	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)	
	NIS	NHDS	NIS	NHDS	NIS	NHDS
203: Osteoarthritis	501 (21)	496 (24)	4.26 (0.05)	4.42 (0.32)	0.15 (0.01)	0.07** (0.00)
254: Rehabilitation care, fitting of prostheses, and adjustment of devices	482 (34)	461 (22)	12.52 (0.29)	12.47 (0.88)	0.66 (0.07)	0.99** (0.06)
149: Biliary tract disease	464 (9)	472 (23)	4.08 (0.03)	4.02 (0.29)	0.84 (0.03)	0.45** (0.02)
50: Diabetes mellitus with complications	461 (9)	456 (22)	5.58 (0.05)	5.39 (0.39)	1.38 (0.04)	1.62* (0.10)
196: Normal pregnancy and/or delivery	453 (17)	3,851** (159)	1.90 (0.01)	2.52** (0.16)	0.00 (0.00)	0.01** (0.00)
159: Urinary tract infections	445 (7)	499* (24)	4.66 (0.05)	4.57 (0.33)	1.66 (0.05)	1.25** (0.08)
181: Other complications of pregnancy	418 (13)	201** (11)	2.46 (0.04)	2.66 (0.24)	0.02 (0.00)	0.09** (0.00)
238: Complications of surgical procedures or medical care	414 (10)	405 (20)	6.17 (0.07)	6.18 (0.45)	1.70 (0.05)	2.19** (0.14)
197: Skin and subcutaneous tissue infections	391 (7)	415 (20)	4.99 (0.04)	4.79 (0.35)	0.59 (0.02)	0.39** (0.02)
128: Asthma	389 (16)	454* (22)	3.29 (0.04)	3.20 (0.24)	0.34 (0.02)	0.18** (0.01)

**Significant at a 5 percent level.*

***Significant at a 1 percent level.*

[1]A significance test was not performed because a valid standard error was not available.

(a) Because of a limited sample, the NHDS estimate and standard error were unreliable and not reported.

(b) The NHDS estimate was reported but was not considered reliable; the standard error was not reported.

(c) A valid standard error could not be calculated.

Table 16. NIS and NHDS Comparisons by Principal Procedure Category, 2001

Principal Procedure	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)	
	NIS	NHDS	NIS	NHDS	NIS	NHDS
137: Other procedures to assist delivery	1,341 (61)	931** (41)	2.07 (0.01)	2.13 (0.15)	0.00 (0.00)	0.00 (0.00)
115: Circumcision	1,120 (42)	1,128 (49)	2.50 (0.02)	2.52 (0.17)	0.00 (0.00)	0.06** (0.00)
134: Cesarean section	992 (35)	962 (43)	3.68 (0.03)	3.63 (0.25)	0.01 (0.00)	0.02 (0.00)
47: Diagnostic cardiac catheterization, coronary arteriography	719 (31)	567** (27)	3.55 (0.05)	3.74 (0.27)	0.97 (0.03)	1.82** (0.11)
45: Percutaneous transluminal coronary angioplasty (PTCA)	701 (46)	508** (24)	2.81 (0.05)	2.79 (0.21)	0.85 (0.04)	0.74 (0.04)
70: Upper gastrointestinal endoscopy, biopsy	697 (17)	637 (29)	5.45 (0.08)	5.72 (0.40)	1.79 (0.05)	1.54* (0.09)
140: Repair of current obstetric laceration	667 (32)	758 (34)	2.05 (0.01)	2.06 (0.15)	0.00 (0.00)	0.00 (0.00)
124: Hysterectomy, abdominal and vaginal	606 (17)	617 (29)	2.81 (0.02)	2.69 (0.19)	0.07 (0.00)	0.16** (0.01)
216: Respiratory intubation and mechanical ventilation	542 (12)	520 (25)	11.16 (0.23)	11.80 (0.83)	29.99 (0.49)	28.95 (1.83)
133: Episiotomy	473 (23)	491 (23)	2.10 (0.01)	2.12 (0.16)	0.00 (0.00)	0.00 (0.00)
222: Blood transfusion	429 (15)	384 (19)	5.76 (0.05)	6.00 (0.44)	6.12 (0.13)	6.14 (0.40)
231: Other therapeutic procedures	419 (50)	430 (21)	5.17 (0.19)	4.83 (0.35)	2.30 (0.21)	3.08** (0.20)
84: Cholecystectomy and common duct exploration	398 (8)	382 (19)	4.47 (0.04)	4.41 (0.33)	0.83 (0.03)	0.41** (0.02)
219: Alcohol and drug rehabilitation/detoxification	379 (40)	309 (16)	5.89 (0.28)	6.24 (0.47)	0.12 (0.01)	0.11 (0.00)
228: Prophylactic vaccinations and inoculations	375 (52)	381 (19)	2.36 (0.05)	2.43 (0.19)	0.00 (0.00)	0.00 (0.00)
152: Arthroplasty knee	363 (14)	355 (18)	4.15 (0.04)	4.33 (0.33)	0.15 (0.01)	0.06** (0.00)
54: Other vascular catheterization, not heart	345 (17)	342 (17)	9.61 (0.23)	11.52* (0.85)	10.04 (0.42)	9.51 (0.63)

Principal Procedure	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)	
	NIS	NHDS	NIS	NHDS	NIS	NHDS
44: Coronary artery bypass graft (CABG)	344 (22)	264** (14)	8.83 (0.11)	9.03 (0.69)	2.42 (0.08)	2.01* (0.13)
153: Hip replacement, total and partial	329 (14)	314 (16)	5.36 (0.04)	5.41 (0.41)	1.19 (0.05)	1.08 (0.07)
3: Laminectomy, excision intervertebral disc	305 (13)	243** (13)	2.72 (0.04)	2.63 (0.22)	0.14 (0.01)	0.20** (0.01)
76: Colonoscopy and biopsy	297 (24)	267 (14)	5.19 (0.39)	5.82 (0.46)	1.08 (0.09)	1.48** (0.10)
80: Appendectomy	282 (7)	289 (15)	3.00 (0.02)	3.09 (0.25)	0.10 (0.01)	0.03** (0.00)
135: Forceps, vacuum, and breech delivery	278 (12)	266 (14)	2.26 (0.01)	2.39 (0.20)	0.00 (0.00)	0.02** (0.00)
78: Colorectal resection	271 (7)	243 (13)	10.07 (0.06)	9.64 (0.75)	4.22 (0.11)	3.86 (0.27)
48: Insertion, revision, replacement, removal of cardiac pacemaker or cardioverter/defibrillator	267 (11)	214** (12)	5.16 (0.07)	5.33 (0.44)	1.72 (0.08)	1.77 (0.12)

**Significant at a 5 percent level.*

***Significant at a 1 percent level.*

[1]A significance test was not performed because a valid standard error was not available.

(a) Because of a limited sample, the NHDS estimate and standard error were unreliable and not reported.

(b) The NHDS estimate was reported but was not considered reliable; the standard error was not reported.

(c) A valid standard error could not be calculated.

APPENDIX C: NIS-MEDPAR TABLES

Table 17. NIS and MedPAR Comparisons by Overall and by Region, 2001

	Number of Discharges in Thousands (Standard Error)		Percentage of Discharges (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)		Average Total Hospital Charge (Standard Error)	
	NIS	**MedPAR**	**NIS**	**MedPAR**	**NIS**	**MedPAR**	**NIS**	**MedPAR**	**NIS**	**MedPAR**
U.S.	13,727 (266)	11,315**	100.00	100.00	5.85 (0.04)	5.90	4.37 (0.04)	4.33	$18,738 (363)	$18,507
Region										
Northeast	2,823 (130)	2,150**	20.56 (0.82)	19.00	6.57 (0.13)	6.83	4.74 (0.12)	4.84	$21,026 (1,282)	$20,978
Midwest	3,325 (126)	3,087	24.22 (0.81)	27.28**	5.50 (0.08)	5.53	3.89 (0.07)	3.93	$16,008 (447)	$15,700
South	5,546 (166)	4,612**	40.40 (0.94)	40.76	5.80 (0.06)	5.84	4.37 (0.06)	4.37	$17,135 (374)	$17,270
West	2,032 (100)	1,465**	14.80 (0.68)	12.95**	5.61 (0.11)	5.53	4.61 (0.17)	4.28	$24,531 (1,119)	$24,689

**Significant at a 5 percent level.*

***Significant at a 1 percent level.*

[1]A significance test was not performed because a valid standard error was not available.

Table 18. NIS and MedPAR Comparisons by Control and Bed Size, 2001

Control / Bed Size	Number of Discharges in Thousands (Standard Error)		Percentage of Discharges (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)		Average Total Hospital Charge (Standard Error)	
	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR
Total Public	1,769 (127)	1,439**	12.89 (0.93)	12.72	6.04 (0.13)	5.89	4.29 (0.11)	4.13	$23,525 (961)	$24,518
1-99 Beds	545 (28)	445**	32.27 (2.33)	30.90	4.49 (0.08)	4.48	4.22 (0.09)	3.93**	$7,813 (239)	$7,978
100-199 Beds	350 (44)	334	20.72 (2.64)	23.19	5.44 (0.15)	5.61	4.43 (0.17)	4.49	$13,130 (576)	$13,413
200-299 Beds	210 (57)	179	12.48 (3.53)	12.46	6.36 (0.27)	6.31	4.53 (0.27)	4.55	$18,799 (2,403)	$16,569
300-499 Beds	360 (88)	238	21.31 (4.78)	16.56	6.51 (0.26)	6.59	4.72 (0.15)	4.47	$21,567 (1,416)	$22,825
500+ Beds	222 (87)	242	13.19 (4.87)	16.86	6.26 (0.66)	6.75	3.85 (0.47)	4.43	$20,766 (1,147)	$22,157
Total Private Non-Profit	10,268 (303)	8,434**	74.80 (1.39)	70.08**	5.87 (0.05)	5.94	4.38 (0.06)	4.36	$18,545 (452)	$18,052
1-99 Beds	1,246 (65)	990**	12.14 (0.68)	11.74	4.78 (0.14)	4.65	4.26 (0.20)	3.99	$9,934 (297)	$9,896
100-199 Beds	2,154 (130)	1,752**	20.98 (1.24)	20.77	5.65 (0.09)	5.63	4.37 (0.09)	4.34	$15,976 (812)	$14,553
200-299 Beds	1,952 (185)	1,661	19.00 (1.79)	19.69	6.00 (0.11)	5.94	4.45 (0.12)	4.38	$19,617 (904)	$17,499*
300-499 Beds	2,931 (265)	2,369*	28.54 (2.52)	28.08	5.96 (0.10)	6.18*	4.38 (0.12)	4.42	$21,090 (1,055)	$20,075
500+ Beds	1,984 (251)	1,660	19.32 (2.29)	19.69	6.52 (0.17)	6.69	4.40 (0.15)	4.51	$21,952 (1,291)	$24,277

Control / Bed Size	Number of Discharges in Thousands (Standard Error)		Percentage of Discharges (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)		Average Total Hospital Charge (Standard Error)	
	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR
Total Proprietary	1,769 (127)	1,439**	12.89 (0.93)	11.96	6.04 (0.13)	5.89	4.29 (0.11)	4.13	$23,525 (961)	$24,518
1-99 Beds	262 (25)	215	14.82 (1.47)	14.95	5.85 (0.49)	4.77*	4.11 (0.26)	3.49*	$17,137 (1,886)	$14,325
100-199 Beds	651 (52)	535*	36.80 (2.58)	37.20	5.79 (0.17)	5.81	4.30 (0.15)	4.09	$22,045 (1,066)	$22,263
200-299 Beds	269 (60)	366	15.22 (3.47)	25.44**	6.54 (0.22)	6.12	4.68 (0.23)	4.34	$24,668 (2,313)	$28,496
300-499 Beds	422 (83)	208*	23.86 (4.36)	14.45*	6.05 (0.23)	6.42	3.98 (0.19)	4.35	$28,472 (3,108)	$32,109
500+ Beds	164 (42)	114	9.28 (2.42)	7.94	6.50 (0.29)	6.68	4.67 (0.27)	4.48	$25,002 (887)	$27,731**

**Significant at a 5 percent level.*

***Significant at a 1 percent level.*

[1]A significance test was not performed because a valid standard error was not available.

Table 19. NIS and MedPAR Comparisons by Location, Teaching Status, and Size, 2001

Hospital Type / Size	Number of Discharges in Thousands (Standard Error)		Percentage of Discharges (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)		Average Total Hospital Charge (Standard Error)	
	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR
Rural	2,702 (93)	2,373**	19.68 (0.65)	20.97*	4.92 (0.07)	5.00	4.20 (0.06)	4.08	$10,446 (307)	$10,677
1-49 beds	651 (27)	484**	24.09 (1.26)	20.41**	4.31 (0.21)	4.14	3.93 (0.10)	3.76	$7,169 (167)	$7,338
50-99 beds	809 (64)	668*	29.96 (2.61)	28.15	4.65 (0.07)	4.70	4.24 (0.10)	4.00*	$9,925 (329)	$9,732
100+ beds	1,241 (111)	1,220	45.93 (2.94)	51.42	5.41 (0.10)	5.50	4.30 (0.10)	4.25	$12,503 (553)	$12,521
Urban, Non-Teaching	5,923 (170)	4,755**	43.14 (0.95)	42.02	5.91 (0.07)	5.90	4.37 (0.08)	4.37	$19,864 (569)	$19,291
1-99 beds	584 (41)	475**	9.86 (0.72)	9.99	5.69 (0.28)	4.95**	4.56 (0.42)	3.98	$13,932 (911)	$12,689
100-199 beds	1,836 (92)	1,571**	31.00 (1.61)	33.03	5.87 (0.10)	5.84	4.49 (0.10)	4.39	$18,829 (868)	$17,692
200+ beds	3,502 (168)	2,709**	59.12 (1.65)	56.96	5.96 (0.09)	6.09	4.27 (0.10)	4.43	$21,395 (849)	$21,378

Hospital Type / Size	Number of Discharges in Thousands (Standard Error)		Percentage of Discharges (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)		Average Total Hospital Charge (Standard Error)	
	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR
Urban, Teaching	5,102 (182)	4,186**	37.16 (0.98)	36.99	6.29 (0.08)	6.43	4.46 (0.08)	4.42	$21,876 (708)	$22,054
1-299 beds	699 (99)	556	13.70 (1.95)	13.28	6.20 (0.16)	6.02	4.47 (0.20)	4.31	$22,356 (2,066)	$19,470
300-499 beds	1,477 (188)	1,159	28.95 (3.63)	27.70	6.15 (0.16)	6.35	4.49 (0.18)	4.36	$22,224 (1,469)	$21,210
500+ beds	2,925 (227)	2,470*	57.33 (3.67)	59.01	6.39 (0.13)	6.55	4.44 (0.11)	4.47	$21,596 (897)	$23,032

**Significant at a 5 percent level.*

***Significant at a 1 percent level.*

[1]A significance test was not performed because a valid standard error was not available.

Table 20. NIS and MedPAR Comparisons by Patient Characteristics, 2001

	Number of Discharges in Thousands (Standard Error)		Percentage of Discharges (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)		Average Total Hospital Charge (Standard Error)	
	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR
Race										
White	8,319 (306)	10,095**	60.60 (1.64)	83.87**	5.86 (0.05)	5.78	4.45 (0.06)	4.35	$18,931 (436)	$18,263
Black	1,059 (77)	1,394**	7.72 (0.56)	11.59**	6.95 (0.12)	6.80	4.44 (0.08)	4.33	$20,930 (1,162)	$20,120
Other	888 (78)	491**	6.47 (0.57)	4.08**	6.52 (0.12)	6.33	4.47 (0.10)	3.80**	$23,934 (762)	$23,536
Unknown	3,459 (242)	53**	25.20 (1.77)	0.44**	5.33 (0.07)	5.85**	4.11 (0.07)	3.88**	$16,287 (601)	$17,860**
Age Group										
0-64 Years	1,939 (43)	1,858	14.13 (0.28)	15.44**	6.16 (0.06)	6.23	2.21 (0.04)	2.19	$18,396 (402)	$18,623
65-74 Years	4,256 (92)	3,651**	31.00 (0.19)	30.34**	5.54 (0.04)	5.62	3.35 (0.04)	3.44*	$20,117 (396)	$20,058
75-84 Years	5,019 (110)	4,241**	36.56 (0.19)	35.23**	5.92 (0.04)	5.96	4.70 (0.05)	4.55**	$19,044 (371)	$18,984
85+ Years	2,511 (55)	2,284**	18.29 (0.20)	18.97**	6.03 (0.06)	6.07	7.09 (0.08)	7.06	$16,059 (388)	$16,018

	Number of Discharges in Thousands (Standard Error)		Percentage of Discharges (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)		Average Total Hospital Charge (Standard Error)	
	NIS	**MedPAR**	**NIS**	**MedPAR**	**NIS**	**MedPAR**	**NIS**	**MedPAR**	**NIS**	**MedPAR**
Gender										
Female	7,840 (148)	6,845**	57.11 (0.16)	56.87	5.87 (0.04)	5.91	4.06 (0.04)	4.04	$17,754 (349)	$17,635
Male	5,887 (121)	5,189**	42.88 (0.16)	43.12	5.84 (0.04)	5.93	4.77 (0.05)	4.70	$20,050 (392)	$20,084

**Significant at a 5 percent level.*

***Significant at a 1 percent level.*

[1]A significance test was not performed because a valid standard error was not available.

Table 21. NIS and MedPAR Comparisons by DRG, 2001

DRG	Number of Discharges in Thousands (Standard Error)		Percentage of Discharges (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)		Average Total Hospital Charge (Standard Error)	
	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR
127: Heart Failure & Shock	782 (16)	632**	5.70 (0.06)	5.59	5.19 (0.03)	5.24	4.53 (0.07)	4.67	$13,252 (339)	$12,863
89: Simple Pneumonia & Pleurisy Age >17 w/ CC	565 (10)	475**	4.12 (0.05)	4.19	5.75 (0.04)	5.81	6.10 (0.10)	6.07	$13,369 (265)	$13,011
88: Chronic Obstructive Pulmonary Disease	433 (8)	368**	3.15 (0.04)	3.25*	5.07 (0.04)	5.04	2.12 (0.06)	1.97*	$11,968 (286)	$11,254*
209: Major Joint & Limb Reattachment Procedures Of Lower Extremity	418 (15)	356**	3.04 (0.09)	3.14	4.93 (0.04)	4.95	0.86 (0.04)	0.87	$26,237 (483)	$25,443
116: Oth Perm Card Pacemak Impl Or Ptca w/ Coronary Artery Stent Implnt	364 (20)	285**	2.65 (0.11)	2.51	3.51 (0.06)	3.60	0.92 (0.04)	0.92	$29,354 (718)	$29,107
14: Specific Cerebrovascular Disorders Except TIA	363 (7)	297**	2.65 (0.02)	2.62	5.78 (0.05)	5.81	10.84 (0.18)	10.99	$15,493 (331)	$15,253
462: Rehabilitation	341 (24)	264**	2.48 (0.17)	2.33	12.04 (0.24)	12.36	0.79 (0.08)	0.29**	$18,759 (815)	$19,409
430: Psychoses	336 (18)	299*	2.44 (0.13)	2.64	10.80 (0.25)	10.97	0.14 (0.01)	0.13	$14,312 (582)	$13,789
143: Chest Pain	294 (8)	235**	2.14 (0.04)	2.07	2.01 (0.01)	2.08**	0.10 (0.01)	0.13*	$7,080 (153)	$6,845
182: Esophagitis	290 (6)	245**	2.11 (0.02)	2.16	4.30 (0.03)	4.34	1.33 (0.05)	1.35	$10,605 (231)	$10,134*

DRG	Number of Discharges in Thousands (Standard Error)		Percentage of Discharges (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)		Average Total Hospital Charge (Standard Error)	
	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR
296: Nutritional & Misc Metabolic Disorders Age >17 w/ CC	287 (5)	241**	2.09 (0.02)	2.13	4.99 (0.04)	5.07	4.56 (0.11)	4.59	$11,157 (260)	$10,871
174: G.I. Hemorrhage w/ CC	286 (6)	233**	2.08 (0.02)	2.06	4.70 (0.03)	4.77*	3.46 (0.08)	3.52	$13,074 (285)	$12,693
138: Cardiac Arrhythmia & Conduction Disorders w/ CC	233 (5)	191**	1.69 (0.01)	1.69	3.92 (0.03)	3.96	2.89 (0.09)	2.87	$10,757 (277)	$10,404
416: Septicemia Age >17	212 (5)	170**	1.54 (0.03)	1.50	7.31 (0.07)	7.39	19.67 (0.30)	20.03	$21,051 (766)	$20,621
320: Kidney & Urinary Tract Infections Age >17 w/ CC	208 (4)	179**	1.52 (0.02)	1.58**	5.22 (0.05)	5.26	2.77 (0.09)	2.89	$11,379 (239)	$11,065
79: Respiratory Infections & Inflammations Age >17 w/ CC	191 (5)	154**	1.39 (0.03)	1.36	8.48 (0.09)	8.44	15.63 (0.25)	15.19	$21,242 (687)	$20,731
121: Circulatory Disorders W Ami & Major Comp	190 (5)	153**	1.38 (0.02)	1.35	6.15 (0.05)	6.27*	0.00 (0.00)	0.00[1]	$19,834 (492)	$19,373
132: Atherosclerosis w/ CC	172 (5)	140**	1.25 (0.03)	1.23	2.87 (0.03)	2.89	0.76 (0.05)	0.78	$8,387 (278)	$8,110
15: Transient Ischemic Attack & Precerebral Occlusions	171 (4)	140**	1.25 (0.02)	1.23	3.35 (0.03)	3.44**	0.49 (0.04)	0.49	$9,808 (240)	$9,523
124: Circulatory Disorders Except Ami	155 (7)	126**	1.13 (0.04)	1.12	4.23 (0.06)	4.32	1.02 (0.06)	0.99	$18,187 (496)	$18,318
148: Major Small & Large Bowel Procedures w/ CC	148 (3)	123**	1.08 (0.01)	1.09	12.02 (0.08)	12.27**	8.23 (0.18)	8.38	$44,914 (943)	$43,984

DRG	Number of Discharges in Thousands (Standard Error)		Percentage of Discharges (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)		Average Total Hospital Charge (Standard Error)	
	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR
210: Hip & Femur Procedures Except Major Joint Age >17 w/ CC	134 (3)	114**	0.98 (0.01)	1.01*	6.76 (0.06)	6.85	2.93 (0.11)	3.12	$23,701 (460)	$22,790*
316: Renal Failure	132 (3)	109**	0.96 (0.01)	0.97	6.58 (0.05)	6.59	10.72 (0.27)	10.45	$17,933 (556)	$17,448
478: Other Vascular Procedures w/ CC	121 (4)	100**	0.88 (0.02)	0.89	7.24 (0.11)	7.36	3.26 (0.12)	3.39	$31,651 (752)	$31,477
141: Syncope & Collapse w/ CC	119 (3)	97**	0.87 (0.01)	0.86	3.50 (0.03)	3.56	0.49 (0.04)	0.52	$9,638 (273)	$9,393

**Significant at a 5 percent level.*

***Significant at a 1 percent level.*

[1]A significance test was not performed because a valid standard error was not available.

Table 22. NIS and MedPAR Comparisons by Principal Diagnosis, 2001

Principal Diagnosis	Number of Discharges in Thousands (Standard Error)		Percentage of Discharges (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)		Average Total Hospital Charge (Standard Error)	
	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR
108: Congestive heart failure, nonhypertensive	800 (17)	647**	5.83 (0.05)	5.72	5.62 (0.04)	5.70	4.96 (0.08)	5.13*	$16,193 (411)	$15,996
101: Coronary atherosclerosis and other heart disease	774 (33)	607**	5.64 (0.18)	5.36	3.96 (0.06)	4.01	1.00 (0.03)	1.06	$25,218 (729)	$25,539
122: Pneumonia (except that caused by tuberculosis or sexually transmitted disease)	730 (13)	612**	5.32 (0.06)	5.41	6.51 (0.05)	6.59	7.86 (0.10)	7.80	$17,019 (346)	$16,740
106: Cardiac dysrhythmias	468 (12)	378**	3.41 (0.04)	3.34	3.87 (0.03)	3.92	1.46 (0.04)	1.52	$16,871 (419)	$16,340
100: Acute myocardial infarction	455 (14)	365**	3.31 (0.06)	3.23	6.05 (0.07)	6.04	11.01 (0.15)	11.23	$30,228 (731)	$29,437
127: Chronic obstructive pulmonary disease and bronchiectasis	422 (8)	361**	3.07 (0.04)	3.19*	5.43 (0.05)	5.40	3.19 (0.08)	2.97**	$13,924 (330)	$13,227*
109: Acute cerebrovascular disease	395 (8)	324**	2.88 (0.03)	2.86	6.32 (0.06)	6.41	11.18 (0.19)	11.30	$18,564 (422)	$18,620
254: Rehabilitation care, fitting of prostheses, and adjustment of devices	346 (25)	268**	2.52 (0.17)	2.37	12.17 (0.24)	12.47	0.79 (0.08)	0.30**	$19,127 (830)	$19,738
102: Nonspecific chest pain	339 (10)	275**	2.47 (0.05)	2.43	2.12 (0.02)	2.18**	0.10 (0.01)	0.13**	$8,016 (156)	$7,855
237: Complication of device, implant or graft	328 (10)	278**	2.39 (0.05)	2.46	5.81 (0.07)	5.81	2.45 (0.07)	2.34	$26,740 (643)	$26,736

Principal Diagnosis	Number of Discharges in Thousands (Standard Error)		Percentage of Discharges (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)		Average Total Hospital Charge (Standard Error)	
	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR
55: Fluid and electrolyte disorders	321 (6)	268**	2.34 (0.03)	2.37	4.80 (0.04)	4.90*	3.98 (0.10)	4.02	$10,988 (270)	$10,749
203: Osteoarthritis	308 (13)	256**	2.24 (0.08)	2.26	4.40 (0.07)	4.31	0.20 (0.01)	0.20	$24,194 (461)	$23,904
226: Fracture of neck of femur (hip)	257 (6)	213**	1.87 (0.02)	1.88	6.56 (0.07)	6.45	3.23 (0.09)	3.41*	$22,661 (421)	$22,012
159: Urinary tract infections	257 (5)	219**	1.87 (0.02)	1.93*	5.27 (0.05)	5.30	2.49 (0.08)	2.61	$11,808 (250)	$11,548
2: Septicemia (except in labor)	235 (6)	188**	1.71 (0.03)	1.66	8.43 (0.09)	8.56	19.17 (0.29)	19.57	$25,991 (847)	$25,861
153: Gastrointestinal hemorrhage	220 (4)	181**	1.60 (0.01)	1.60	4.98 (0.03)	5.09**	4.75 (0.11)	4.75	$15,020 (320)	$14,751
50: Diabetes mellitus with complications	205 (4)	175**	1.49 (0.02)	1.55*	6.54 (0.07)	6.51	2.18 (0.08)	2.28	$17,985 (473)	$17,933
205: Spondylosis, intervertebral disc disorders, other back problems	205 (6)	178**	1.49 (0.03)	1.57*	4.15 (0.05)	4.05	0.41 (0.03)	0.39	$17,284 (427)	$17,036
69: Affective disorders	183 (10)	164	1.33 (0.07)	1.45	10.19 (0.25)	10.34	0.16 (0.02)	0.16	$13,912 (545)	$13,382
238: Complications of surgical procedures or medical care	182 (4)	149**	1.32 (0.02)	1.32	7.02 (0.08)	6.96	2.69 (0.09)	2.79	$21,025 (505)	$21,224
149: Biliary tract disease	174 (4)	146**	1.27 (0.01)	1.29	5.27 (0.05)	5.35	1.80 (0.07)	1.76	$20,258 (376)	$19,705

Principal Diagnosis	Number of Discharges in Thousands (Standard Error)		Percentage of Discharges (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)		Average Total Hospital Charge (Standard Error)	
	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR
145: Intestinal obstruction without hernia	166 (3)	140**	1.21 (0.01)	1.23	6.76 (0.05)	6.92**	4.50 (0.12)	4.73	$19,050 (398)	$19,090
245: Syncope	161 (4)	129**	1.17 (0.02)	1.14	3.16 (0.03)	3.24*	0.36 (0.03)	0.40	$9,799 (256)	$9,692
146: Diverticulosis and diverticulitis	160 (3)	129**	1.17 (0.01)	1.14	5.68 (0.04)	5.83**	1.92 (0.08)	1.97	$17,162 (347)	$17,033
197: Skin and subcutaneous tissue infections	160 (3)	132**	1.17 (0.01)	1.16	5.87 (0.06)	5.84	1.07 (0.05)	1.04	$12,504 (365)	$12,152

**Significant at a 5 percent level.*

***Significant at a 1 percent level.*

[1]A significance test was not performed because a valid standard error was not available.

Table 23. NIS and MedPAR Comparisons by Principal Procedure, 2001

Principal Procedure	Number of Discharges in Thousands (Standard Error)		Percentage of Discharges (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)		Average Total Hospital Charge (Standard Error)	
	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR
70: Upper gastrointestinal endoscopy, biopsy	402 (10)	334**	2.93 (0.04)	2.95	6.01 (0.05)	6.13*	2.29 (0.06)	2.38	$16,559 (392)	$16,201
47: Diagnostic cardiac catheterization, coronary arteriography	362 (17)	294**	2.63 (0.09)	2.60	4.09 (0.05)	4.18	1.43 (0.05)	1.42	$18,733 (496)	$18,640
45: Percutaneous transluminal coronary angioplasty (PTCA)	355 (24)	275**	2.58 (0.15)	2.43	3.13 (0.06)	3.21	1.28 (0.06)	1.28	$29,150 (888)	$29,393
222: Blood transfusion	270 (10)	209**	1.97 (0.07)	1.85	5.92 (0.06)	6.03	6.88 (0.16)	7.08	$16,048 (411)	$15,621
216: Respiratory intubation and mechanical ventilation	246 (5)	208**	1.79 (0.03)	1.84	9.49 (0.18)	9.29	42.10 (0.39)	41.47	$41,446 (1,002)	$39,711
153: Hip replacement, total and partial	223 (8)	188**	1.63 (0.05)	1.66	5.64 (0.05)	5.69	1.55 (0.07)	1.62	$27,953 (536)	$27,044
152: Arthroplasty knee	211 (8)	183**	1.54 (0.05)	1.61	4.35 (0.05)	4.35	0.21 (0.02)	0.19	$25,524 (497)	$24,965
48: Insertion, revision, replacement, removal of cardiac pacemaker or cardioverter/defibrillator	206 (9)	165**	1.50 (0.05)	1.46	5.22 (0.08)	5.32	1.86 (0.08)	1.84	$38,692 (974)	$37,676
146: Treatment, fracture or dislocation of hip and femur	183 (4)	156**	1.33 (0.02)	1.38*	6.28 (0.05)	6.38	2.39 (0.08)	2.56*	$21,862 (426)	$21,072
44: Coronary artery bypass graft (CABG)	179 (12)	139**	1.31 (0.07)	1.22	9.73 (0.12)	9.66	3.37 (0.13)	3.51	$63,383 (1,980)	$65,181

Principal Procedure	Number of Discharges in Thousands (Standard Error)		Percentage of Discharges (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)		Average Total Hospital Charge (Standard Error)	
	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR
76: Colonoscopy and biopsy	173 (7)	139**	1.26 (0.04)	1.23	5.84 (0.17)	6.13	1.48 (0.08)	1.56	$15,091 (616)	$15,180
58: Hemodialysis	169 (5)	150**	1.23 (0.03)	1.33*	5.60 (0.07)	5.43*	4.45 (0.15)	4.17	$16,402 (424)	$15,598
54: Other vascular catheterization, not heart	163 (9)	143*	1.19 (0.06)	1.26	9.50 (0.22)	9.47	15.14 (0.63)	15.15	$27,252 (1,253)	$26,703
78: Colorectal resection	145 (3)	119**	1.05 (0.01)	1.05	11.00 (0.07)	11.23**	6.36 (0.17)	6.54	$40,856 (854)	$40,016
84: Cholecystectomy and common duct exploration	141 (3)	120**	1.02 (0.01)	1.06*	5.95 (0.06)	6.05	1.85 (0.08)	1.91	$23,920 (447)	$23,263
61: Other OR procedures on vessels other than head and neck	136 (5)	115**	0.99 (0.02)	1.02	6.95 (0.13)	7.19	4.43 (0.15)	4.71	$33,176 (1,034)	$33,274
213: Physical therapy exercises, manipulation, and other procedures	129 (16)	93*	0.94 (0.11)	0.82	11.92 (0.50)	11.27	0.86 (0.11)	0.52**	$20,414 (1,599)	$18,992
231: Other therapeutic procedures	126 (16)	108	0.92 (0.12)	0.96	5.54 (0.25)	5.49	5.48 (0.33)	5.66	$14,683 (685)	$14,200
193: Diagnostic ultrasound of heart (echocardiogram)	122 (11)	104	0.89 (0.08)	0.92	5.51 (0.10)	5.65	2.65 (0.14)	2.83	$15,768 (597)	$14,868
39: Incision of pleura, thoracentesis, chest drainage	103 (2)	85**	0.75 (0.01)	0.75	8.14 (0.07)	8.34**	8.62 (0.24)	8.86	$21,655 (501)	$21,348
51: Endarterectomy, vessel of head and neck	103 (4)	84**	0.75 (0.02)	0.75	2.93 (0.05)	3.08**	0.47 (0.04)	0.49	$16,945 (415)	$17,274

Principal Procedure	Number of Discharges in Thousands (Standard Error)		Percentage of Discharges (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate Percent (Standard Error)		Average Total Hospital Charge (Standard Error)	
	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR	NIS	MedPAR
169: Debridement of wound, infection or burn	101 (2)	86**	0.73 (0.01)	0.76	11.64 (0.20)	11.39	4.79 (0.19)	4.90	$31,035 (857)	$30,339
177: Computerized axial tomography (CT) scan head	94 (11)	72	0.68 (0.08)	0.64	4.97 (0.14)	5.34**	4.41 (0.22)	4.78	$12,878 (942)	$13,631
113: Transurethral resection of prostate (TURP)	91 (3)	73**	0.66 (0.01)	0.64	3.34 (0.06)	3.44	0.34 (0.04)	0.40	$11,617 (304)	$11,121
3: Laminectomy, excision intervertebral disc	90 (4)	80*	0.65 (0.02)	0.71*	3.68 (0.07)	3.63	0.32 (0.04)	0.33	$16,922 (482)	$16,023

**Significant at a 5 percent level.*

***Significant at a 1 percent level.*

[1]A significance test was not performed because a valid standard error was not available.

APPENDIX D: ESTIMATES OF STANDARD ERROR FOR NHDS STATISTICS

Estimates of Standard Error for NHDS Statistics

A variety of statistics were estimated based on these NHDS data:

1. Total number of discharges
2. In-Hospital mortality
3. Average length of stay (calculated as the difference between discharge and admission dates).

The standard errors were calculated as follows:

Total Numbers of Discharges

From the NHDS Documentation (National Center for Health Statistics, 2002), constants *a* and *b* were obtained for 2000. The relative standard error for the estimate of total discharges was approximated by:

$$RSE(W_{TD}) = \sqrt{a + b/W_{TD}}$$

where W_{TD} was the weighted sum of total discharges (i.e., the estimate of total discharges).

The standard error was then calculated as:

$$SE = RSE \times W_{TD}$$

Percent Mortality

Let *p* be the estimated proportion of in-hospital deaths (with the number of deaths estimated as the numerator and the discharge estimate as the denominator). The relative standard error of this proportion expressed as a percent was approximated by:

$$RSE(p) = \sqrt{b(1-p)/(p \times W_{TD})}$$

The standard error was then calculated as:

$$SE = RSE \times p$$

Where *b* was the parameter in the formula for approximated $RSE(W_{TD})$ given by the NHDS documentation (i.e., the same used in the formula for calculating the standard error for number of discharges).

Average Length of Stay

Let average length of stay be the estimated average length of stay based on a weighted number of discharges equal to TD. If the weighted sum of patient length of stay was TLOS, and

$$ALOS = \frac{W_{TLOS}}{W_{TD}}$$

then the relative standard error is:

$$RSE(ALOS) = RSE(W_{TLOS} \Big/ W_{TD}) = \sqrt{[RSE(W_{TLOS})^2] + [RSE(W_{TD})^2]}$$

The estimate of the relative standard error was valid only if:

1. The relative standard error of the denominator (estimated discharges) was smaller than five percent.

   - or -

2. Both the relative standard error of the numerator (estimated total stay days) and the denominator (estimated discharges) were smaller than ten percent.

For all parameter estimates, when values of *a* and *b* were available in the NHDS documentation (i.e., for procedures, gender, region, race, and diagnoses), the appropriate values for *a* and *b* were used. When a variable represented the sum of more than one NHDS category, as recommended by Korn and Graubard (1999, p.224), the standard error for each category was calculated, and the largest of these standard errors was reported and used in significance testing. For example, the NIS category of "private insurance" includes three NHDS categories: 1) Blue Cross/Blue Shield, 2) HMO/PPO, and 3) other private insurance. The standard error was calculated for all three categories, using the values of *a* and *b* provided in the NHDS documentation, and the largest value was used in computing the t-value to test for significant difference.

When no parameter estimates were available, the values of *a* and *b* for the total sample were used in calculating the standard errors. For example, in the hospital control X bed size comparisons, the values for the total sample were used in calculating standard errors, because the NHDS documentation provides parameter estimates by neither ownership nor bed size.

Tests of Statistical Significance

To test for a statistically significant difference between a NIS estimate, *X*, and a NHDS estimate, *Y*, the following procedure was used. The difference was significant if

$$\left| \frac{(X - Y)}{\sqrt{SE_X^2 + SE_Y^2}} \right| \geq S$$

where SE_X was the estimated standard error for the NIS estimate and SE_Y was the estimated standard error of the NHDS estimate.