H·CUP
HEALTHCARE COST AND UTILIZATION PROJECT

HCUP Methods Series

Comparative Analysis of the HCUP KIDS' Inpatient Database (KID), 1997

Report # 2001-01

Agency for Healthcare Research and Quality

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

Contact Information:

Healthcare Cost and Utilization Project (HCUP)
Agency for Healthcare Research and Quality
540 Gaither Road
Rockville, MD 20850
http://www.hcup-us.ahrq.gov

For Technical Assistance with HCUP Products:

Email: hcup@ahrq.gov

or

Phone: 1-866-290-HCUP

Recommended Citation: Houchens R, Whalen D, Elixhauser A. *Comparative Analysis of the HCUP KIDs' Inpatient Database (KID), 1997*. HCUP Methods Series Report #2001-1. ONLINE. March 16, 2001. U.S. Agency for Healthcare Research and Quality. Available: http://www.hcup-us.ahrq.gov/db/nation/kid/reports/KID_1997_Comparison.pdf

Table of Contents

List of Tables

Summary

This report assesses the potential biases of statistics calculated from the Kids' Inpatient Database (KID) of the Healthcare Cost and Utilization Project (HCUP). The KID contains a sample of pediatric discharges from hospitals in the participating HCUP states for calendar year 1997. Statistics for discharge and hospital-level characteristics of the KID are compared with the Nationwide Inpatient Sample (NIS), National Hospital Discharge Survey (NHDS), and American Hospital Association (AHA) Hospital Survey Data.

Measuring the accuracy of the KID is difficult due to the limited availability of children's healthcare data. In this report we have selected relevant data from general healthcare data sources. In the comparisons, a pediatric subset of the both the NIS and NHDS were used. KID comparisons with NIS estimates showed consistency between the two samples – no significant differences were found.

KID discharge estimates were also consistent with most NHDS discharge estimates, while KID average length-of-stay estimates were generally longer than NHDS estimates. Some of these differences may be signs of KID strengths such as a representative hospital mix. AHA data shows that large hospitals tend to have more complex cases with longer stays than small hospitals. The pediatric NHDS sample under-represents large hospitals and this may result in short NHDS estimates of average length-of-stay. The KID estimates of in-hospital mortality rates appear to be consistent with the NHDS estimates. However, due to the small sample of children in the NHDS, it was not possible to calculate valid estimates of standard error for nearly half of the NHDS average length of stay estimates and nearly all of the NHDS in-hospital mortality rate estimates. Areas where KID discharge estimates were not in line with NHDS estimates were hospital control, hospital bedsize, primary payer, patient race, and diagnosis groups. Significant discharge estimate differences were found for four payer categories (Medicare, self-pay, other payer, and missing). Many of the differences found for primary payer may be due to the absence of payer information from over 10 percent of the NHDS sample. There were no discharges without payer information in the KID sample, while the NHDS estimated 750 thousand pediatric discharges with missing payer information. The KID discharge estimate for private insurance was significantly higher than the NHDS estimate. The NHDS estimate was lower than the KID estimate by 741 thousand discharges – nearly equal to the NHDS estimate for missing payer.

While KID discharge estimates reflect Census numbers well, comparisons with the NHDS on race were not meaningful because of differences in coding and the significant number of discharges without race information (19.9 percent in the NHDS and 19.1 percent in the KID). Also, race information is missing in a non-uniform way in both the KID and NHDS. In the KID race information is missing for several entire states and sometimes for entire hospitals in other states. Validation studies of the NHDS have found that patients with missing race information were more likely to be white than were patients with non-missing race information[1].

Differences in estimates of number of cases by diagnosis group may be due to differences in patient case mix between the two samples related to differences in hospital size. The KID estimates fewer discharges from small hospitals and more discharges from large hospitals than does the NHDS. This report shows, however, that the KID is more representative of the hospital universe (as defined by the AHA) than is the NHDS. For example, the KID estimates of births, by hospital control and size, more closely reflect the number of births reported by AHA hospitals than does the NHDS.

Because of the higher representation of large hospitals, patients in the KID are probably more severely ill, on average, than children in the NHDS. This is reflected in differences with regard to diagnosis groupings and with average length-of-stay estimates. KID estimates for average length-of-stay were generally longer than the corresponding NHDS estimates. Length-of-stay differences may be due to differences in the types of patients from the two samples, and point out another strength of the KID: better representation of children's hospitals. The KID was developed to reflect the universe of hospitals as defined by the AHA Annual Survey. KID weights were calculated by stratification using hospital

characteristics including hospital type: children's or other hospital. As a result, the KID estimate of discharges from children's hospitals is comparable to the AHA count of children's hospital discharges. Determining the extent to which children's hospitals were included in the NHDS was not possible.

The KID estimates of discharge counts appear unbiased in most contexts, and many of the differences found appear to indicate KID strengths. Compared to the NHDS, the KID is more reflective of the racial makeup of the nation and the hospital composition of the AHA. Average length-of-stay estimates from the KID were consistently longer than estimates from the NHDS. These length-of-stay differences may be due to differences in the types of patients from the two samples. The mix of KID hospitals is more representative of the hospital universe (as defined by the AHA) than is the NHDS, especially with regard to hospital size and children's hospitals. As a result, the patient case mix in the KID is probably more complex than the patient case mix of children in the NHDS. It appears that KID estimates of in-hospital mortality rates are consistent with NHDS estimates, but statistical comparisons of in-hospital mortality rates were generally not possible because of the NHDS sample size restrictions.

Introduction

This report assesses potential biases of statistics calculated from the 1997 Kids' Inpatient Database Sample (KID) of the Healthcare Cost and Utilization Project (HCUP). Ideally, relationships among outcomes and their correlates estimated from the KID would generally hold across all U.S. hospitals. However, since only 22 states contributed data to this sample, some estimates may be biased. In this report, we compare estimates for discharge and hospital-level characteristics from the KID data with the National Hospital Discharge Survey (NHDS) data.

KID Data

The HCUP KID was established to enable analyses of pediatric hospital utilization across the United States. The target universe includes all pediatric discharges from all community hospitals in the United States. The KID sampling frame was constructed from the subset of universe hospitals that released their discharge data for research use. Currently, the Agency for Healthcare Research and Quality (AHRQ) has agreements with 22 data sources that maintain statewide, all-payer discharge data files to include their data in the HCUP database. These states are shown in Table 1. The KID is a nationwide sample of pediatric discharges 18 years and younger selected and weighted to all pediatric discharges in the target universe (all community hospitals in the United States. This report examines the KID, comparing it with other data sources.

Table 1: States in the KID Frame

Calendar Years	States in Frame
1997	Arizona, California, Colorado, Connecticut, Florida, Georgia, Iowa, Hawaii, Illinois, Kansas, Massachusetts, Maryland, Missouri, New Jersey, New York, Oregon, Pennsylvania, South Carolina, Tennessee, Utah, Washington, and Wisconsin

Creation of the KID was subject to certain restrictions.

- The Illinois Health Care Cost Containment Council stipulated that no more than 40 percent of the discharges provided by Illinois could be included in the database for any calendar quarter. However, the total number of pediatric discharges in Illinois represents only about 20 percent of all discharges. So, no changes were made to the Illinois sampling frame due to this restriction.
- Georgia, Hawaii, South Carolina and Tennessee stipulated that only those hospitals appearing in sampling strata with two or more hospitals were to be included in the KID. Due to this restriction, two Georgia hospitals, six Hawaii hospitals, six South Carolina hospitals and six Tennessee hospitals were excluded from the 1997 frame, leaving 157 Georgia community hospitals, 11 Hawaii community hospitals, 54 South Carolina community hospitals, and 92 Tennessee community hospitals in the 1997 frame.
- Missouri stipulated that only hospitals that had signed releases for public use should be included in the NIS. For 1997, thirty-five Missouri hospitals signed releases for confidential use only. These hospitals were excluded from the sampling frame, leaving 75 hospitals in the 1997 frame.

KID Sample Design

The KID is a stratified probability sample of pediatric discharges in the frame, with sampling probabilities calculated to select 10 percent of uncomplicated in-hospital births, and 80 percent of other pediatric discharges from all hospitals contained in each frame stratum. The overall objective was to select a sample of pediatric discharges "generalizable" to the target universe, which includes pediatric discharges outside the frame (zero probability of selection). Moreover, this sample was to be geographically dispersed, yet drawn from the subset of states with inpatient discharge data that agreed to provide such data to the project. See *Technical Supplement of the Kids' Inpatient Database (KID) 1997 Design Report*, for more details on the design of the sample.

Sample Weights

Sample weights were developed for the KID to obtain representative national estimates of hospital and inpatient parameters. In developing weights, strata were defined based on six hospital characteristics contained in the AHA hospital files:

1) Geographic Region – Northeast, Midwest, West, and South. This is an important stratum because practice patterns have been shown to vary substantially by region. For example, lengths of stay tend to be longer in East Coast hospitals than in West Coast hospitals.

2) Control – government nonfederal, private not-for-profit, and private investor-owned. These types of hospitals tend to have different missions and different responses to government regulations and policies.

3) Location – urban or rural. Government payment policies often differ according to this designation. Also, rural hospitals are generally smaller and offer fewer services than urban hospitals.

4) Teaching Status – teaching or nonteaching. The missions of teaching hospitals differ from nonteaching hospitals. In addition, financial considerations differ between these two hospital groups. Currently, the Medicare DRG payments are uniformly higher to teaching hospitals than to nonteaching hospitals. A hospital is considered to be a teaching hospital if it has an AMA-approved residency program or is a member of the Council of Teaching Hospitals (COTH).

5) Bedsize – small, medium, and large. Bedsize categories are based on hospital beds, and are specific to the hospital's location and teaching status, as shown in Table 2.

Table 2: KID Bedsize Categories

Location and Teaching Status	Hospital Bedsize		
	Small	Medium	Large
Rural	1-49	50-99	100+
Urban, nonteaching	1-99	100-199	200+
Urban, teaching	1-299	300-499	500+

Rural hospitals were not split according to teaching status, because rural teaching hospitals were rare. The bedsize categories were defined within location and teaching status because they would otherwise have been redundant. Rural hospitals tend to be small; urban nonteaching hospitals tend to be medium-sized; and urban teaching hospitals tend to be large. Yet it was important to recognize gradations of size within these types of hospitals.

6) Hospital Type – children's or other hospital. Children's hospitals restrict admissions to children while other hospitals admit both adults and children. There may be significant differences in practice patterns, severity of illness, and available services between children's hospitals and other hospitals.

Refer to *Technical Supplement of the Kids' Inpatient Database (KID) 1997 Design Report*, for more details on the development of sample weights.

NIS Data

The 1997 NIS, Release 6 was established to provide analyses of hospital utilization across the United States. For each calendar year, the NIS universe of hospitals was established as all community hospitals located in the U.S. However, the NIS sampling frame was constructed from the subset of universe hospitals that released their discharge data for research use. Currently, AHRQ has agreements with 22 data sources that maintain statewide, all-payer discharge data files to include their data in the HCUP database. These are the same as the KID states shown in Table 1. All 22 of these states were included in Release 6,` which is composed of all discharges from a sample of hospitals from these frame states.

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. The overall objective was to select a sample of hospitals "generalizable" to the target universe, including hospitals outside the frame (which had a zero probability of selection). See *Design of the HCUP Nationwide Inpatient Sample, Release 6*, for more details on the design of the sample.

Comparisons in this report used a pediatric subset of the NIS sample, drawn by selecting all discharges with a patient age of 18 years or younger. The resulting sample contained approximately 1.3 million records. This sample is referred to as the NIS for the remainder of the report.

NHDS Data

The National Hospital Discharge Survey (NHDS), 1997 is conducted by the National Center for Health Statistics. The NHDS includes about 300,000 discharges sampled from 474 hospitals. Statistics calculated from the NHDS do have sampling error. However, the statistics are assumed to be unbiased because the sampling frame is relatively unrestricted, encompassing all nonfederal, acute-care, general U.S. hospitals with six or more beds.

To be part of the NHDS, hospitals must have six or more beds staffed for patient use. The NHDS includes discharges from short-stay U.S. hospitals (hospitals with an average length of stay under 30 days), general-specialty (medical or surgical) hospitals, and children's hospitals. Federal, military, and Veterans Affairs hospitals are excluded from the survey. The NHDS sampling frame includes very few specialty hospitals such as psychiatric, maternity, alcohol/chemical dependency, orthopedic, and head-injury hospitals.

Comparisons in this report used a pediatric subset of the NHDS sample, drawn by selecting all discharges with a patient age of 18 years or younger. The resulting sample contained exactly 67,000 records. This sample is referred to as the NHDS for the remainder of the report. Significant differences between the KID and NHDS samples are shown in Table 3.

Table 3: Differences Between the KID and NHDS Samples Used in This Analysis

Characteristic	Database	
	KID	**Pediatric NHDS**
Intended Universe	Pediatric discharges from community hospitals as defined by the AHA – nonfederal, short-term general, or other special hospitals that are not a hospital unit of an institution.	Pediatric discharges from short-stay hospitals (hospitals with an average length of stay of less than 30 days), general-specialty (medical or surgical) hospitals, or children's hospitals. The NHDS does not include federal, military, and Veterans Affairs hospitals, nor does it include hospital units of institutions (i.e., prison hospitals).
Specialty hospitals and units	AHA community hospitals may be specialty hospitals. Some AHA community hospitals include specialty units – obstetrics/ gynecology; short-term rehabilitation; and ear, nose, and throat.	Includes discharges from a few specialty hospitals (i.e., psychiatric, maternity, alcohol/chemical dependency, orthopedic, and head injury rehabilitation hospitals).
HMO enrollees	Included	Included
Bedsize	No restriction on bedsize.	Must have at least six beds staffed for patient use.
Sampling Frame	22 states	50 states and the District of Columbia
Sample Design	By geographic region, control/ownership, location, teaching status, bedsize (bedsize categories are specific to the hospital's location and teaching status), and hospital type. 2,521 hospitals	Includes all hospitals with at least 1,000 beds or more than 40,000 discharges annually - plus an additional sample of hospitals based on a stratified three-stage design. 474 hospitals
Discharges Included in Database	Sampled pediatric discharges from all frame hospitals. 1.9 million discharges	Pediatric discharges from a sample of discharges from sampled hospitals. 67,000 discharges
Charges	Reported charges missing for some HMO enrollees.	Not reported
Reassignment of Diagnosis Codes	None	If the first listed diagnosis was a symptom and a secondary code was a diagnosis, the diagnosis replaced the symptom, which was moved back.

Comparison Issues

Methods

The following measures were chosen to compare estimates from the KID and pediatric NIS and NHDS databases:

- Total number of discharges
- Average length-of-stay
- In-hospital mortality

These measures of utilization and outcomes were selected because they are typically used in health services research. Differences were reported at the one and five percent significance levels.

For each statistic, a test was performed to determine whether a difference was statistically significant between the KID and NHDS estimates.

The NIS and NHDS estimates were based on samples, so two-sample t-tests were used. For NHDS comparisons, statistical tests were made only when valid estimates of the NHDS standard error could be made. Due to size constraints, valid estimates were not available for all breakdowns of the NHDS data[2]. It was not possible to calculate valid estimates of standard error for nearly half of the average length-of-stay estimates and nearly all the in-hospital mortality estimates. Refer to the Appendix for a description of the comparison tests and an explanation of restrictions on calculating NHDS standard errors.

For NIS – KID comparisons, the above statistics were compared within the following types of strata:

- Geographic regions (Midwest, Northeast, West, and South)
- Hospital characteristics (ownership and bedsize)
- Patient characteristics (age, race, gender, and payer)

For NHDS – KID comparisons, the statistics listed above were compared within these strata:

- Geographic regions (Midwest, Northeast, West, and South)
- Hospital characteristics (ownership and bedsize)
- Patient characteristics (age, race, gender, and payer)
- Diagnosis Related Groups (DRGs)
- Diagnosis groups (The principal diagnosis code for each discharge was assigned to a diagnosis group defined by the Clinical Classifications System (CCS), formerly known as Clinical Classifications for Health Policy Research (CCHPR), Version 2 algorithm — see Elixhauser and McCarthy, 1996)[3].

All KID and NIS statistics used sample weights and accounted for the sample design using the SUDAAN microcomputer statistical software to calculate finite sample statistics and their variances. All NHDS statistics were calculated with Statistical Analysis System (SAS) microcomputer software. Standard errors cannot be calculated directly from the NHDS data. Instead, NHDS documentation provides formulas for calculating relative standard error (RSE) estimates based on discharge counts. The formulas are described in the Appendix. As noted above, the RSE estimates are valid only for sufficiently large discharge estimates. Consequently, statistical comparisons could not be made for some small group comparisons such as DRGs, diagnosis groups, and procedure groups[4]. These restrictions are explained in the Appendix.

Race and Ethnicity

Careful attention is necessary for any analysis of discharge data by race and ethnicity. The data used in this report originates with hospitals that collect race/ethnicity information primarily from the patients or by the registrar through observation. There are no validity checks, and for most hospitals, race/ethnicity is not a service delivery issue. For example, some hospitals report "other" race for all non-white patients, resulting in over-reporting for this race category. Reliability is consequently an underlying issue whenever dealing with race and ethnicity.

In addition to the underlying problems with race/ethnicity data described above, there are additional, specific problems of availability of information and recording of information. Availability and coding of race/ethnicity information varies between the KID and the NHDS samples. Both samples contain significant numbers of discharges without race/ethnicity information: 19.1% of KID discharges and 19.9% of pediatric discharges from the NHDS are affected.

While the KID contains uniform values for race, there is variation in source data from the participating HCUP partner states. Three KID states, Illinois, Oregon, and Washington do not report race/ethnicity data. A fourth state, Utah, reports race/ethnicity on only 20 percent of discharges. Together, these four states represent nearly 14 percent of the KID sample. Other KID states also contributed discharges with missing race/ethnicity information, albeit to a lesser degree. Because NHDS does not report data by state, it is not possible to discern if the pattern of missing data is state specific.

The KID and NHDS samples record race/ethnicity in different ways. For this report, the race/ethnicity information for both samples were re-classified as shown in Table 4, to White, Black, other, or missing.

Table 4: Reclassification of Race and Ethnicity – KID and NHDS Data

	Report	
Race Category	**KID**	**NHDS**
White	White	White
Black	Black	Black
Other	Asian/Pacific Islander Hispanic Native American other race	Asian/Pacific Islander Native American other race
Unavailable	unavailable & invalid	Missing

The KID and NHDS data files deal with Hispanic ethnicity differently. The KID treats Hispanic ethnicity as a separate racial category while the NHDS ignores ethnicity. Table 5, below, compares the two data files with the U.S. Census Bureau estimates of the 1997 population[5]. The Census Bureau treats Hispanic ethnicity as a classification separate from race, so it is possible to look at racial distribution with and without considering Hispanic ethnicity. The KID offers some advantages when considering Hispanic ethnicity because of higher representations of minorities when compared to the pediatric subset of the NHDS.

Table 5: Racial Distribution in KID, NHDS, and Census, 1997

	Hospital Discharges		Population Census	
Race Category	KID	NHDS	With Hispanic	Without Hispanic
White	47.5%	57.6%	72.7%	82.7%
Black	15.5%	14.7%	12.1%	12.7%
other	17.1%	8.6%	15.2%	4.7%
missing	19.9%	19.1%	---	---

AHA Comparisons

Comparison of Births

Measuring the accuracy of the KID is difficult due to the limited availability of children's healthcare data. In this report we have selected relevant data from general healthcare data sources. In the comparisons above, a pediatric subset of the both the NIS and NHDS were used. It is also possible to compare the estimated number of births from the KID with birth estimates from other data. Table 6 compares births from the American Hospital Association (AHA) Annual Survey, the U.S. Census Bureau 1997 estimates, the KID, and the NHDS. The AHA data is based on hospital reporting periods, which do not necessarily correspond to the calendar year. The Census estimate represents all births in the United States, while the KID and NHDS estimates are respectively based on diagnoses codes and newborn indicators. Statistics from all four sources are very consistent. The KID and NHDS estimates are both slightly lower than the AHA and Census numbers, but within one percent of the AHA birth statistic.

Table 6: 1997 Births (in thousands)

AHA Survey	Census Estimate	KID Estimate	NHDS Estimate
3,817	3,884	3,747	3,790

Hospital Universe

Table 7 shows that the hospital profiles of the KID and NHDS samples differ. The KID estimates fewer discharges from small hospitals and more discharges from large hospitals than does the NHDS. Since the AHA data does not separately report pediatric discharges, direct comparisons with the AHA are not possible. However, the AHA survey does report births, so it is possible to compare births from the KID, NHDS and AHA.

Table 7 compares the percentage of total births by hospital control and bedsize, and suggests that the hospital makeup of the KID is a closer fit to the AHA than is the NHDS. For example the NHDS does not contain any births or discharges from very large (500+ beds) private/investor owned hospitals although the AHA reports nearly 1 percent of births from such hospitals. Across all control and bedsize categories, the KID closely reflects the distribution of births reported in the AHA survey. This is not surprising considering that the KID design is based on the AHA survey to reflect the hospital profile of the nation. But is does suggest that the KID might be a better tool for analyses that consider hospital bedsize.

Table 7: Comparison of Births from the NHDS, KID, and AHA, 1997

		Births as a Percent of Total Births		
Hospital Control	**Bedsize**	**NHDS**	**KID**	**AHA**
Private/Investor	1 - 99	3.5%	1.6%	1.3%
	100 - 199	5.2%	4.8%	4.4%
	200 - 299	1.3%	3.0%	2.6%
	300 - 499	2.4%	2.2%	2.3%
	500+	0.0%	0.8%	0.7%
Private/Nonprofit	1 - 99	10.1%	6.8%	7.0%
	100 - 199	21.5%	14.9%	15.5%
	200 - 299	15.7%	14.0%	14.1%
	300 - 499	19.1%	23.0%	22.0%
	500+	9.0%	14.1%	14.8%
Government/Nonfederal	1 - 99	3.7%	3.2%	3.2%
	100 - 199	2.0%	3.2%	3.1%
	200 - 299	1.0%	1.5%	2.4%
	300 - 499	3.8%	3.7%	3.1%
	500+	1.6%	3.4%	3.5%

Children's Hospitals

The KID was developed to reflect the universe of hospitals as defined by the AHA Annual Survey. KID weights were calculated by stratification using hospital characteristics including hospital type: children's or other hospital. As a result, the KID estimate of discharges from children's hospitals is comparable to the AHA count of children's hospital discharges as shown in Table 8. Determining the extent to which children's hospitals were included in the NHDS was not possible.

Table 8: Discharges from Children's Hospitals

AHA Survey	KID Estimate
452,594	430,854

In the KID, the case mix in children's hospitals tends to be more complex than the case mix for discharges from other hospitals. Table 9 compares the average estimates for number of diagnoses, number of procedures, length-of-stay, and total charge from the KID for children's hospitals and other hospitals. Patients in children's hospitals have more diagnoses and receive nearly twice as many surgical procedures as do patients in other hospitals. Their average length of stay is over 70 percent longer than the average in other hospitals. Finally, the average charge for patients in children's hospitals is more than three times the average charge for children in other hospitals.

Table 9: KID Children's Hospitals Compared with Other KID Hospitals

Average	Children's Hospitals	Other Hospitals
Number of diagnoses	3.41	2.36
Number of procedures	1.48	0.76
Length-of-stay (days)	5.58	3.27
Total charge (dollars)	18,041	5,367

Average Length of Stay

In the KID/NHDS comparisons discussed in a later section, KID average length-of-stay estimates were mostly longer than the estimates from the pediatric NHDS. Overall the KID estimate, at nearly 3.5 days, was more than 50 percent longer than the NHDS estimate. Because valid standard errors were not available for all NHDS estimates (see Appendix), close to half of the potential comparisons were not possible. Of the statistical comparisons that were made, nearly all indicated significant differences between the two samples and the KID estimate was longer than the NHDS estimate in most of these differences. Two possible explanations for these differences are the differences in hospital make up of the two samples, and a possible under-representation of children's hospitals in the NHDS.

The KID estimate of discharges from children's hospitals is comparable to the AHA count of children's hospital discharges as shown in Table 8. In the KID, discharges from children's hospitals are more complex, with more surgical procedures and longer lengths of stay, on average, than discharges from other hospitals. Average length-of-stay estimates from the NHDS might be too low if the NHDS under-weights discharges from children's hospitals.

As shown in Table 7, the NHDS estimates a disproportionately high number of births from small hospitals. Small hospitals may have a less complex case mix than large hospitals. Differences in average severity of illness are likely to cause differences in the average length-of-stay estimates. Such a relationship is demonstrated for AHA discharges in Table 10. While it is not possible to isolate pediatric discharges in the AHA data, AHA data supports this hypothesis for all discharges. Table 10, based on AHA data, shows that both average stay length and surgical procedures per discharge increase as hospital size increases. (Average stay was calculated from inpatient days and inpatient discharges).

Table 10: AHA Average Stay and Surgeries by Hospital Size

Hospital Size	Average Stay (Days)	Surgeries per 1000 Discharges
1-99 beds	4.93	246.00
100-199 beds	5.00	290.67
200-299 beds	5.23	313.57
300-499 beds	5.41	320.38
500+ beds	5.99	334.84

Overall, discharges from large hospitals tend to have longer stays, and receive more services than discharges from small hospitals. It is not possible to directly analyze pediatric discharges using AHA data, but it is possible to examine the availability of special hospital units that would likely treat sick children. The AHA survey indicates which hospitals have neonatal care units (intermediate and intensive), units that would be utilized by infants with severe illnesses. Patients in neonatal care units can be expected to use more services and have longer stays than the average newborn. Table 11 shows the percentage of hospitals with neonatal care units (intermediate and intensive) by hospital size. Less than 4 percent of the smallest community hospitals (1-99 beds) have a neonatal intensive care unit while over 75% of the largest hospitals have such units. If hospitalizations of sick children are more likely in large hospitals, then the NHDS may under-represent them.

Table 11: AHA Neonatal Units by Hospital Bedsize

Hospital Size	Number of Hospitals	Percent with		
		Neonatal Intermediate Care Units	Neonatal Intensive Care Units	Any Neonatal Care Unit
1-99 beds	2,618	2.83%	1.41%	3.74%
100-199 beds	1,187	14.66%	15.08%	24.68%
200-299 beds	585	21.37%	30.43%	43.25%
300-499 beds	509	32.22%	52.65%	62.08%
500+ beds	214	45.79%	71.03%	75.23%

NIS Comparison Results

Comparisons of KID and NIS estimates are shown on Table 12 through Table 18. These tables compare total discharges, average length of stay, and in-hospital mortality estimates from the two samples across various groupings. KID estimates were consistent with all NIS estimates: no significant differences were found between estimates from the two samples. KID estimates were more precise, that is, KID estimates of standard error were generally smaller than the corresponding NIS standard error estimates.

Table 12: KID and NIS Comparisons by Region, 1997

	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
	C-NIS	**NIS**	**C-NIS**	**NIS**	**C-NIS**	**NIS**
U.S.	6,657 (90)	6,617 (170)	3.42 (0.03)	3.45 (0.06)	0.42 (0.01)	0.40 (0.20)
Census Region						
Northeast	1,277 (43)	1,192 (77)	3.87 (0.04)	3.87 (0.17)	0.43 (0.02)	0.37 (0.04)
Midwest	1,500 (43)	1,545 (72)	3.38 (0.06)	3.45 (0.08)	0.43 (0.03)	0.43 (0.03)
South	2,330 (80)	2,403 (104)	3.38 (0.07)	3.60 (0.11)	0.39 (0.02)	0.41 (0.03)
West	1,549 (40)	1,477 (84)	3.15 (0.07)	2.89 (0.14)	0.45 (0.02)	0.38 (0.04)

* *Difference is significant at the 0.05 level.*

** *Difference is significant at the 0.01 level.*

Table 13: KID and NIS Comparisons by Hospital Control, 1997

	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
	C-NIS	NIS	C-NIS	NIS	C-NIS	NIS
Control						
Private/ Investor-owned	706 (31)	742 (60)	2.78 (0.06)	2.84 (0.12)	0.21 (0.02)	0.20 (0.03)
Private/ Nonprofit	4,858 (75)	4,821 (140)	3.44 (0.03)	3.43 (0.06)	0.44 (0.01)	0.41 (0.02)
Government/ Nonfederal	1,093 (47)	1,055 (76)	3.73 (0.11)	3.97 (0.23)	0.49 (0.03)	0.51 (0.05)

* *Difference is significant at the 0.05 level.*
** *Difference is significant at the 0.01 level.*

Table 14: KID and NIS Comparisons by Hospital Bedsize, 1997

Bedsize	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
	C-NIS	NIS	C-NIS	NIS	C-NIS	NIS
6-99 beds	750	712	2.24	2.22	0.10	0.09
	(23)	(25)	(0.04)	(0.06)	(0.01)	(0.01)
100-199 beds	1,481	1,360	2.85	2.86	0.27	0.25
	(47)	(74)	(0.07)	(0.11)	(0.02)	(0.03)
200-299 beds	1,256	1,119	3.29	3.24	0.36	0.32
	(58)	(102)	(0.09)	(0.15)	(0.03)	(0.04)
300-499 beds	1,819	1,908	3.62	3.60	0.47	0.42
	(68)	(109)	(0.05)	(0.09)	(0.02)	(0.03)
500+ beds	1,351	1,518	4.55	4.53	0.74	0.72
	(70)	(116)	(0.08)	(0.16)	(0.03)	(0.04)

* *Difference is significant at the 0.05 level.*

** *Difference is significant at the 0.01 level.*

Table 15: KID and NIS Comparisons by Expected Primary Payer, 1997

	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
	C-NIS	NIS	C-NIS	NIS	C-NIS	NIS
Medicare	14 (1)	15 (2)	4.36 (0.20)	4.35 (0.25)	2.26 (0.25)	2.55 (0.34)
Medicaid	2,458 (42)	2,395 (82)	3.75 (0.04)	3.81 (0.09)	0.43 (0.01)	0.42 (0.02)
Private Insurance	3,534 (59)	3,585 (109)	3.21 (0.02)	3.23 (0.05)	0.37 (0.01)	0.34 (0.02)
Self-pay	353 (11)	330 (13)	2.74 (0.03)	2.80 (0.07)	0.66 (0.03)	0.69 (0.05)
No charge	21 (5)	19 (6)	3.73 (0.19)	3.36 (0.16)	0.70 (0.11)	0.49 (0.15)
Other payor	256 (19)	256 (39)	3.94 (0.15)	4.03 (0.24)	0.59 (0.04)	0.53 (0.05)
Missing	0 ** (0)	17 (4)	0.00 ** (0.00)	3.11 (0.33)	0.00 ** (0.00)	0.69 (0.21)

* *Difference is significant at the 0.05 level.*

** *Difference is significant at the 0.01 level.*

Table 16: KID and NIS Comparisons by Age Group, 1997

	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
	C-NIS	NIS	C-NIS	NIS	C-NIS	NIS
Up to 1 year	4,448 (63)	4,505 (117)	3.27 (0.03)	3.33 (0.06)	0.44 (0.01)	0.43 (0.02)
1-4 years	642 (15)	591 (29)	3.27 (0.04)	3.23 (0.08)	0.39 (0.01)	0.34 (0.03)
5-9 years	385 (9)	363 (20)	3.82 (0.05)	3.85 (0.10)	0.36 (0.02)	0.33 (0.03)
10-14 years	391 (9)	362 (17)	4.57 (0.06)	4.68 (0.15)	0.42 (0.02)	0.37 (0.03)
15-18 years	814 (12)	796 (20)	3.59 (0.04)	3.57 (0.08)	0.35 (0.01)	0.31 (0.02)
Missing	0 (0)	0 (0)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)

* *Difference is significant at the 0.05 level.*
** *Difference is significant at the 0.01 level.*

Table 17: KID and NIS Comparisons by Gender, 1997

	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
	C-NIS	NIS	C-NIS	NIS	C-NIS	NIS
Male	3,314 (46)	3,288 (88)	3.57 (0.03)	3.61 (0.07)	0.48 (0.01)	0.45 (0.02)
Female	3,342 (45)	3,328 (83)	3.27 (0.03)	3.30 (0.06)	0.36 (0.01)	0.35 (0.02)

* *Difference is significant at the 0.05 level.*
** *Difference is significant at the 0.01 level.*

Table 18: KID and NIS Comparisons by Race, 1997

	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
	C-NIS	NIS	C-NIS	NIS	C-NIS	NIS
White	3,162	2,977	3.22	3.22	0.34	0.32
	(64)	(103)	(0.03)	(0.06)	(0.01)	(0.02)
Black	1,033	904	4.06	4.23	0.57	0.57
	(35)	(58)	(0.06)	(0.10)	(0.02)	(0.02)
Other	1,138	1,174	3.43	3.40	0.43	0.42
	(30)	(82)	(0.06)	(0.14)	(0.02)	(0.03)
Missing	1,325	1,562	3.39	3.48	0.50	0.45
	(54)	(109)	(0.07)	(0.11)	(0.03)	(0.04)

* *Difference is significant at the 0.05 level.*

** *Difference is significant at the 0.01 level.*

NHDS Comparison Results

The KID and pediatric NHDS samples are quite different in makeup. The KID was designed as a sample of pediatric discharges while the pediatric NHDS is a subset of pediatric discharges from a sample of all discharges. The two samples are of radically different sizes. The pediatric NHDS is less than 4 percent the size of the KID sample, and as a result the number of sample points in some strata may not be sufficiently large for meaningful analysis. Sample sizes are evaluated for each of the comparisons that follow.

Overall Comparison and by Region

Comparisons of KID and NHDS estimates, overall and by census region, are presented in Table 19 and Table 20. Overall, and by census region, KID discharge estimates were consistent with estimates from the NHDS; no significant differences were found when comparing the KID and NHDS discharge estimates. Significant differences were found between the two samples in average length-of-stay estimates, while no statistical comparisons were possible for in-hospital mortality rates.

Table 19: KID and NHDS Comparisons by Region, 1997

	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
	C-NIS	NHDS	C-NIS	NHDS	C-NIS	NHDS
U.S.	6,657 (90)	6,970 (367)	3.42 ** (0.03)	2.24 (0.16)	0.42 [a] (0.01)	0.41 (b)
Census Region						
Northeast	1,277 (43)	1,306 (102)	3.87 ** (0.04)	1.92 (0.23)	0.43 [a] (0.02)	0.43 (b)
Midwest	1,500 (43)	1,583 (147)	3.38 ** (0.06)	2.37 (0.31)	0.43 [a] (0.03)	0.37 (b)
South	2,330 (80)	2,526 (143)	3.38 ** (0.07)	1.77 (0.17)	0.39 [a] (0.02)	0.44 (b)
West	1,549 (40)	1,554 (113)	3.15 [a] (0.07)	3.14 (b)	0.45 [a] (0.02)	0.37 (b)

[a] *A significance test was not performed because a valid NHDS standard error was not available.*
[b] *The NHDS sample size was too small to calculate a valid estimate of standard error.*

* *Difference is significant at the 0.05 level.*
** *Difference is significant at the 0.01 level.*

Average length-of-stay estimates from the KID were significantly longer than NHDS estimates – overall and in three of the four regions. The average length-of-stay differences reflect the differences in hospital makeup of the two samples. As shown with births in Table 7, the NHDS is more reliant on small hospitals than is the KID and less reflective of the hospital makeup of the universe for pediatric hospitalizations. Discharges from small hospitals tend to be less complex with shorter stays than discharges from larger hospitals, as shown in Table 10.

As previously noted, another possible reason for the shorter NHDS average length-of-stay would be an under representation of children's hospitals in the NHDS. The KID estimate of discharges from children's hospitals is comparable to the AHA count of children's hospital discharges as shown in Table 8. In the KID, discharges from children's hospitals are more complex, with more surgical procedures and longer lengths-of-stay, on average, than discharges from other hospitals. Average length-of-stay estimates from the NHDS might be too low if the NHDS under weights discharges from children's hospitals. Determining the extent to which children's hospitals were represented in the NHDS was not possible, however.

Overall, the KID estimate was 53 percent longer than the NHDS estimates. In three of the four regions (Northeast, Midwest, and South), the KID average length-of-stay estimates were significantly longer than the NHDS estimates. In these three regions, the KID estimates were respectively 101 percent, 43 percent, and 91 percent longer than the NHDS estimates. In the fourth region, the West, there was little difference between the KID and NHDS estimates (3.15 days and 3.14 days), although no significance test was possible.

It was not possible to create reliable estimates of standard error for the overall and regional NHDS in-hospital mortality rates. As a result, no statistical comparisons were possible. The overall in-hospital mortality rate estimates were 0.42 percent and 0.41 percent from the KID and NHDS samples respectively.

Table 20: Sample Sizes – Overall and by Region, 1997

Strata	KID	NHDS
Overall	1,905,797	67,000
Region		
Northeast	561,446	14,633
Midwest	309,365	19,730
South	421,174	22,953
West	613,812	9,684

Comparisons by Hospital Control and Size

A comparison of KID and NHDS samples sizes by the two hospital strata (control and bedsize) is shown in Table 21. As shown in the table, the NHDS sample is relatively small for several strata including government/nonfederal hospitals and large hospitals.

Table 21: Sample Sizes – By Hospital Strata, 1997

Strata	KID	NHDS
Hospital Control		
Private/investor-owned	284,892	6,313
Private/nonprofit	1,457,734	57,156
Government/nonfederal	163,171	3,531
Hospital Size		
1-99 Beds	146,342	5,506
100-199 Beds	407,961	15,393
200-299 Beds	392,211	16,177
300-499 Beds	545,805	21,907
500+ Beds	413,478	8,017

Table 22 compares KID and NHDS estimates by hospital-control: private/investor-owned, private/nonprofit, and government/nonfederal. In two of the three hospital-control categories, including the large private/nonprofit group, there was no significant difference between the KID and NHDS discharge estimates. In the government/nonfederal category, the KID discharge estimate was 23 percent higher than the NHDS estimate. KID estimates for average length-of-stay were longer than the NHDS estimates for all three hospital-control categories, ranging from 47 percent higher for private/nonprofit hospitals to 80 percent higher for private/investor-owned hospitals. No statistical comparisons were possible for in-hospital mortality rates by hospital-control.

Table 22: KID and NHDS Comparisons by Hospital Control, 1997

Hospital Control	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
	C-NIS	NHDS	C-NIS	NHDS	C-NIS	NHDS
Private/ Investor-owned	706 (31)	755 (43)	2.78 ** (0.06)	1.55 (0.13)	0.21 [a] (0.02)	0.12 (b)
Private/ Nonprofit	4,858 (75)	5,327 (281)	3.44 ** (0.03)	2.33 (0.17)	0.44 [a] (0.01)	0.42 (b)
Government/ Nonfederal	1,093 ** (47)	888 (50)	3.73 ** (0.11)	2.29 (0.18)	0.49 [a] (0.03)	0.57 (b)

[a] *A significance test was not performed because a valid NHDS standard error was not available.*
[b] *The NHDS sample size was too small to calculate a valid estimate of standard error.*

* *Difference is significant at the 0.05 level.*
** *Difference is significant at the 0.01 level.*

Comparisons of KID and NHDS estimates by hospital bedsize are shown in Table 23. Significant differences were found for most discharge and all average length-of-stay estimates. No statistical comparisons were possible for in-hospital mortality rates. The KID estimates fewer discharges for small hospitals (6 to 99 beds and 100 to 199 beds) than does the NHDS, but more discharges from the largest hospitals (500 or more beds). As shown previously in Table 7, the KID closely reflects the distribution of births reported in the AHA survey across all control and bedsize categories, which suggests that the KID discharge estimates by hospital control and bedsize should be close to the actual numbers. Average length-of-stay estimates from the KID were longer than the NHDS estimates for all hospital size categories except the smallest hospitals (6 to 99 beds) where the C estimate was shorter than the NHDS estimate. If we expect large hospitals to have more complex hospitalizations than small hospitals, then average lengths of stay from large hospitals should be longer than average lengths of stay from small hospitals. Such a relationship holds for KID estimates, but not for NHDS estimates. Average length-of-stay estimates from the KID were shortest for the smallest hospitals (6 to 99 beds) and longest for the largest hospitals (500 or more beds). The opposite relationship occurred with NHDS estimates. NHDS estimates of average length-of-stay were longest for the smallest hospitals (6 to 99 beds) and shortest for the largest hospitals (500 or more beds). These NHDS estimates were contrary to the overall average stays from the AHA data shown in Table 10.

Table 23: KID and NHDS Comparisons by Hospital Bedsize, 1997

Bedsize	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
	C-NIS	NHDS	C-NIS	NHDS	C-NIS	NHDS
6-99 beds	750 **	1,240	2.24 *	2.69	0.10 [a]	0.10
	(23)	(69)	(0.04)	(0.20)	(0.01)	(b)
100-199 beds	1,481 **	1,929	2.85 **	2.14	0.27 [a]	0.31
	(47)	(104)	(0.07)	(0.16)	(0.02)	(b)
200-299 beds	1,256	1,366	3.29 **	2.25	0.36 [a]	0.47
	(58)	(75)	(0.09)	(0.17)	(0.03)	(b)
300-499 beds	1,819	1,703	3.62 **	2.10	0.47 [a]	0.67
	(68)	(93)	(0.05)	(0.16)	(0.02)	(b)
500+ beds	1,351 **	732	4.55 **	2.07	0.74 [a]	0.42
	(70)	(42)	(0.08)	(0.17)	(0.03)	(b)

[a] *A significance test was not performed because a valid NHDS standard error was not available.*
[b] *The NHDS sample size was too small to calculate a valid estimate of standard error.*

* *Difference is significant at the 0.05 level.*
** *Difference is significant at the 0.01 level.*

Comparisons by Patient Characteristics

KID and NHDS estimates are compared across a number of patient characteristics in Table 25 through Table 28. Categories of patient characteristics examined include age, gender, and race, as well as expected payer. Table 24 compares the sample sizes of the two samples by patient categories.

Table 24: Sample Sizes – By Patient Strata, 1997

Strata	KID	NHDS
Primary Payer		
Medicare	4,411	203
Medicaid	729,313	21,216
Private Insurance	990,666	26,034
Self-Pay	98,483	3,935
No Charge	5,578	211
Other Payer	69,233	8,664
Age Group		
0 Days	689,694	33,612
Up to 1 Month	73,729	2,516
Up to 1 Year	203,167	6,126
1-4 Years	258,546	7,713
5-9 Years	163,953	4,981
10-14 Years	166,991	4,523
15-18 Years	349,717	7,529
Gender		
Male	949,257	34,050
Female	956,295	32,950
Race		
White	851,287	35,960
Black	300,463	11,093
Other	420,355	5,172
Missing	333,692	14,775

Primary Payer

Table 25 compares KID and NHDS estimates by expected primary payer. Significant differences were found with most discharge estimates and average length-of-stay estimates. Where statistical comparisons were possible, no significant differences were found for in-hospital mortality rates. Many of the differences found may be caused by the absence of payer information from over 10 percent of the NHDS sample.

In five of the seven payer categories, the KID discharge estimate was lower than the NHDS estimate. The difference was significant in four of those categories (Medicare, self-pay, other payer, and missing). There were no discharges without payer information in the KID sample, while the NHDS estimated 750 thousand pediatric discharges with missing payer information. The KID discharge estimate for private insurance was significantly higher than the NHDS estimate. The NHDS estimate was lower than the KID estimate by 741 thousand discharges – nearly equal to the NHDS estimate for missing payer.

Four comparisons were possible for average length-of-stay estimates and significant differences were found between the KID and NHDS estimates for all four. The KID estimate were longer than the NHDS estimate for three of the categories (Medicaid, private insurance, and other payer) and shorter than the NHDS estimate for one (self-pay). As previously noted, NHDS length-of-stay estimates may be too low due to an over-representation of discharges from small hospitals. Three statistical comparisons were possible with the in-hospital mortality rate and no significant differences were found.

Table 25: KID and NHDS Comparisons by Expected Primary Payer, 1997

	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
	C-NIS	NHDS	C-NIS	NHDS	C-NIS	NHDS
Medicare	14 **	38	4.36 [a]	2.39	2.26 [a]	1.90
	(1)	(4)	(0.20)	(b)	(0.25)	(b)
Medicaid	2,458	2,444	3.75 **	2.03	0.43 [a]	0.43
	(42)	(153)	(0.04)	(0.21)	(0.01)	(b)
Private Insurance	3,534 **	2,793	3.21 **	2.42	0.37	0.36
	(59)	(28)	(0.02)	(0.02)	(0.01)	(0.06)
Self-pay	353 **	435	2.74 **	4.19	0.66	0.51
	(11)	(7)	(0.03)	(0.07)	(0.03)	(0.12)
No charge	21	26	3.73 [a]	0.31	0.70 [a]	0.00
	(5)	(3)	(0.19)	(b)	(0.11)	(b)
Other payor	256 **	484	3.94 **	1.78	0.59	0.31
	(19)	(14)	(0.15)	(0.05)	(0.04)	(0.16)
Missing	0 **	750	0.00 [a]	1.49	0.00 [a]	0.42
	(0)	(107)	(0.00)	(b)	(0.00)	(b)

[a] *A significance test was not performed because a valid NHDS standard error was not available.*
[b] *Unable to calculate a valid estimate of the NHDS standard error for this level of aggregation.*

* *Difference is significant at the 0.05 level.*
** *Difference is significant at the 0.01 level.*

Age Group

No significant differences were found between the KID and NHDS estimates when compared by age group as shown in Table 26. Statistical comparisons were possible only for discharge estimates, no statistical comparisons were possible for either average length-of-stay or in-hospital mortality rates and no significant differences were found for any discharge estimates.

Table 26: KID and NHDS Comparisons by Age Group, 1997

	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
	C-NIS	NHDS	C-NIS	NHDS	C-NIS	NHDS
0 days	3,792	3,790	3.04 [a]	1.79	0.40 [a]	0.34
	(58)	(0)	(0.03)	(b)	(0.01)	(b)
Up to 1 month	178	203	5.96 [a]	1.65	1.17 [a]	1.64
	(4)	(27)	(0.09)	(b)	(0.07)	(b)
Up to 1 year	478	572	4.06 [a]	2.67	0.50 [a]	0.45
	(11)	(74)	(0.04)	(b)	(0.02)	(b)
1-4 years	619	688	3.27 [a]	3.02	0.39 [a]	0.41
	(14)	(88)	(0.04)	(b)	(0.01)	(b)
5-9 years	385	436	3.82 [a]	3.03	0.36 [a]	0.49
	(9)	(56)	(0.05)	(b)	(0.02)	(b)
10-14 years	391	412	4.57 [a]	2.70	0.42 [a]	0.49
	(9)	(53)	(0.06)	(b)	(0.02)	(b)
15-18 years	814	868	3.59 [a]	2.85	0.35 [a]	0.29
	(12)	(111)	(0.04)	(b)	(0.01)	(b)

[a] *A significance test was not performed because a valid NHDS standard error was not available.*
[b] *Unable to calculate a valid estimate of the NHDS standard error for this level of aggregation.*

* *Difference is significant at the 0.05 level.*
** *Difference is significant at the 0.01 level.*

Gender

Table 27 compares statistics generated from the KID and NHDS samples by gender. No significant differences were found between the samples with either the discharge or in-hospital mortality estimates. KID estimates of average length of stay, however, were significantly higher than the NHDS estimates for both males and females by 62 and 43 percent respectively. Again, NHDS length-of-stay estimates may not reflect actual length-of-stays in the universe because of the over weighting of discharges from small hospitals in the NHDS sample.

Table 27: KID and NHDS Comparisons by Gender, 1997

	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
	C-NIS	NHDS	C-NIS	NHDS	C-NIS	NHDS
Male	3,314 (46)	3,493 (166)	3.57 ** (0.03)	2.20 (0.16)	0.48 (0.01)	0.47 (0.08)
Female	3,342 (45)	3,477 (128)	3.27 ** (0.03)	2.29 (0.15)	0.36 (0.01)	0.34 (0.06)

[a] *A significance test was not performed because a valid NHDS standard error was not available.*
[b] *Unable to calculate a valid estimate of the NHDS standard error for this level of aggregation.*

[*] *Difference is significant at the 0.05 level.*
[**] *Difference is significant at the 0.01 level.*

Race

Comparisons by race are shown in Table 28. Significant differences between the KID and NHDS estimates were found with discharge estimates and average length-of-stay estimates. Two of the KID discharge estimates were significantly different from the NHDS estimates. The KID estimate was higher for other race and lower for Whites. Two statistical average in-hospital mortality comparisons were possible. In both cases (Whites and Blacks), the KID estimate was longer than the NHDS estimate. No statistical comparisons were possible for in-hospital mortality rates. Comparisons by race are difficult because of differences between the samples in the coding of race, as previously noted.

Table 28: KID and NHDS Comparisons by Race, 1997

	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
	C-NIS	**NHDS**	**C-NIS**	**NHDS**	**C-NIS**	**NHDS**
White	3,162 **	4,012	3.22 **	2.20	0.34 [a]	0.38
	(64)	(242)	(0.03)	(0.20)	(0.01)	(b)
Black	1,033	1,024	4.06 **	2.03	0.57 [a]	0.65
	(35)	(75)	(0.06)	(0.24)	(0.02)	(b)
Other	1,138 **	602	3.43 [a]	2.29	0.43 [a]	0.31
	(30)	(77)	(0.06)	(b)	(0.02)	(b)
Missing	1,325	1,331	3.39 [a]	2.52	0.50 [a]	0.31
	(54)	(189)	(0.07)	(b)	(0.03)	(b)

[a] *A significance test was not performed because a valid NHDS standard error was not available.*
[b] *Unable to calculate a valid estimate of the NHDS standard error for this level of aggregation.*

* *Difference is significant at the 0.05 level.*
** *Difference is significant at the 0.01 level.*

Comparisons by Diagnosis Related Groups (DRGs)

Table 29 and Table 30 compare the KID and NHDS samples across the 20 most common Diagnosis Related Groups (DRGs) as found on the KID. For discharge estimates, significant differences were found between the two samples for six of the 20 DRGs. In four of these DRGs, the KID estimate was lower than the NHDS estimate: bronchitis & asthma (98), Miscellaneous digestive disorders (184), psychoses (430), and otitis media (70). The KID estimate was significantly higher for two DRG categories: viral illness & fever (422) and seizure & headache (26). For in-hospital mortality rate estimates, no statistical comparisons were possible.

Significant differences were found between the two samples for 14 average length-of-stay estimates, while no statistical comparisons were possible for in-hospital mortality rates. The KID estimate was generally longer than the NHDS estimate, but many of the NHDS estimates do not have face validity. For example, the NHDS average length-of-stay estimate for neonates with other significant problems (390) was less than one day (0.38 days) – less than the average length-of-stay estimate for normal newborns (391). Similar short length-of-stay estimates occur for prematurity with major problems (387), extreme immaturity or neonatal respiratory distress syndrome (386) and appendectomies (167). The NHDS length-of-stay estimates may be affected by outliers due to the small sample sizes (Table 29).

Table 29: Sample Sizes (unweighted numbers of cases) – By DRG, 1997

Strata	KID	NHDS
DRG		
391: normal newborn	257,111	23,791
390: neonate w/ other significant problems	168,025	4,977
98: bronchitis & asthma age 0-17	149,789	4,521
389: full term neonate w/ major problems	143,730	3,102
373: vaginal delivery w/o complications	101,091	1,892
91: simple pneumonia & pleurisy age 0-17	72,599	1,846
184: esophagitis, gastroent & misc digest	66,523	1,822
388: prematurity w/o major problems	58,090	1,257
298: nutritional & misc metabolic disorders	44,371	1,134
387: prematurity w/ major problems	39,798	894
422: viral illness & fever of unknown origin	33,547	680
385: neonates, died or transferred	35,542	662
430: psychoses	31,192	816
386: extreme immaturity or respiratory distress syndrome, neonate	30,157	689
26: seizure & headache age 0-17	26,717	508
70: otitis media & uri age 0-17	22,968	476
167: appendectomy w/o complicated principal diag w/o cc	21,147	666
322: kidney & urinary tract infections	20,418	570
372: vaginal delivery w/ complicating diagnoses	16,068	326
451: poisoning & toxic effects of drugs	14,523	379

Table 30: KID and NHDS Comparisons by DRGs Ranked on KID Data (weighted estimate), 1997

Rank[1]	Diagnosis Related Group (DRG)	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
		C-NIS	NHDS	C-NIS	NHDS	C-NIS	NHDS
1	391: normal newborn	2,653 (40)	2,761 (105)	1.82 ** (0.01)	1.05 (0.07)	0.00 a (0.00)	0.00 (b)
2	390: neonate w/ other significant problems	564 (15)	521 (23)	2.37 ** (0.02)	0.38 (0.04)	0.00 a (0.00)	0.00 (b)
3	98: bronchitis & asthma age 0-17	354 ** (8)	428 (19)	2.67 ** (0.02)	1.93 (0.15)	0.00 a (0.00)	0.05 (b)
4	389: full term neonate w/ major problems	316 (7)	294 (14)	4.32 ** (0.04)	1.02 (0.09)	0.00 a (0.00)	0.00 (b)
5	373: vaginal delivery w/o complicating diagnoses	235 (4)	232 (12)	1.90 ** (0.01)	0.63 (0.07)	0.00 a (0.00)	0.10 (b)
6	91: simple pneumonia & pleurisy age 0-17	184 (5)	197 (11)	3.20 ** (0.03)	1.24 (0.12)	0.11 a (0.01)	0.19 (b)
7	184: esophagitis, gastroent & misc digest disorders age 0-17	163 ** (3)	191 (10)	2.35 ** (0.02)	3.40 (0.28)	0.02 a (0.00)	0.53 (b)
8	388: prematurity w/o major problems	127 (2)	128 (8)	4.61 ** (0.05)	1.58 (0.17)	0.00 a (0.00)	0.00 (b)
9	298: nutritional & misc metabolic disorders age 0-17	106 (3)	110 (7)	2.90 ** (0.05)	2.10 (0.22)	0.13 a (0.02)	0.34 (b)
10	387: prematurity w/ major problems	86 (2)	85 (6)	14.62 a (0.18)	1.26 (b)	0.00 a (0.00)	0.00 (b)

[1] *C-NIS rank is based on number of discharges.*

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

[b] *The NHDS sample size was too small to calculate a valid estimate of standard error.*

* *Difference is significant at the 0.05 level.*

** *Difference is significant at the 0.01 level.*

Table 30: KID and NHDS Comparisons by DRGs Ranked on KID Data, 1997 (continued)

Rank[1]	Diagnosis Related Group (DRG)	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
		C-NIS	NHDS	C-NIS	NHDS	C-NIS	NHDS
11	422: viral illness & fever of unknown origin age 0-17	80 ** (2)	58 (5)	2.61 ** (0.02)	4.51 (0.52)	0.03 a (0.01)	0.00 (b)
12	385: neonates, died or transferred to another acute care facility	79 (2)	73 (5)	5.89 ** (0.21)	43.22 (3.95)	19.95 a (0.54)	20.42 (b)
13	430: psychoses	76 * (4)	91 (6)	8.45 a (0.18)	0.30 (b)	0.00 a (0.00)	0.00 (b)
14	386: extreme immaturity or respiratory distress syndrome, neonate	68 (2)	71 (5)	33.02 ** (0.45)	2.62 (0.31)	0.00 a (0.00)	0.00 (b)
15	26: seizure & headache age 0-17	62 ** (2)	42 (4)	2.62 ** (0.03)	5.96 (0.74)	0.16 a (0.02)	0.00 (b)
16	70: otitis media & uri age 0-17	52 ** (1)	70 (5)	2.51 a (0.02)	0.93 (b)	0.01 a (0.00)	0.00 (b)
17	167: appendectomy w/o complicated principal diag w/o cc	49 (1)	55 (5)	2.05 a (0.01)	0.66 (b)	0.00 a (0.00)	0.00 (b)
18	322: kidney & urinary tract infections age 0-17	49 (1)	53 (5)	3.43 a (0.03)	0.40 (b)	0.02 a (0.01)	0.00 (b)
19	372: vaginal delivery w/ complicating diagnoses	40 (1)	35 (4)	2.69 a (0.03)	0.00 (b)	0.00 a (0.00)	0.00 (b)
20	451: poisoning & toxic effects of drugs age 0-17	34 (1)	39 (4)	1.82 ** (0.03)	13.84 (1.62)	0.18 a (0.03)	0.00 (b)

[1] *C-NIS rank is based on number of discharges.*

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

[b] *The NHDS sample size was too small to calculate a valid estimate of standard error.*

* *Difference is significant at the 0.05 level.*

** *Difference is significant at the 0.01 level.*

Comparisons by Principal Diagnosis

Comparisons by principal diagnosis are shown in Table 31 and Table 32. Estimates from the KID and NHDS samples were compared across the 20 most common principal diagnoses, grouped by the Clinical Classification System (CCS), categories of diagnoses of interest to public policy researchers. Diagnoses are ranked according to the estimated number of KID discharges for each category. Significant differences were found between the two samples in both discharge and average length-of-stay estimates. No statistical comparisons were possible for in-hospital mortality rates. NHDS estimates may be affected by small sample sizes (Table 32).

Table 31: Sample Sizes (unweighted numbers of cases) – By Diagnoses, 1997

Strata	KID	NHDS
Diagnosis Groups		
218: Liveborn	675,290	33691
128: Asthma	86,698	2731
122: Pneumonia (except caused by tuberculosis and STD)	77,936	2018
125: Acute bronchitis	62,491	1766
55: Fluid and electrolyte disorders	38,630	1017
142: Appendicitis and other append conds	35,490	777
69: Affective disorders	28,681	736
224: Other perinatal conditions	26,416	897
126: Other upper respiratory infections	25,872	752
193: Trauma to perineum and vulva	27,059	1
83: Epilepsy, convulsions	25,836	447
7: Viral infections	24,688	651
135: Intestinal infection	23,524	2601
196: Normal pregnancy and/or delivery	22,306	669
154: Noninfectious gastroenteritis	21,794	612
159: Urinary tract infections	21,775	597
181: Other complications of pregnancy	17,033	397
45: Maint chemotherapy, radiotherapy	16,550	178
233: Intracranial injury	16,194	383
230: Fracture of lower limb	16,162	548

Discharge estimates differed between the KID and NHDS samples for ten of the 20 diagnosis categories. Of the ten significant differences, the KID estimate was higher than the NHDS estimate in five instances and lower in the other five. In one instance (epilepsy/convulsions) the difference may be due to the NHDS practice of reordering diagnoses when the first listed diagnosis is a symptom.

Statistical comparisons were possible for average length-of-stay estimates in 13 diagnosis groups. In three of the 13 groups the KID estimate was shorter than the NHDS estimate, while in six of the 13 groups the KID estimate was longer. No differences was found between sample estimates with the remaining four groups. NHDS average length-of-stay estimates may be affected by an over-weighting of discharges from small hospitals, as noted above.

Table 32: KID and NHDS Comparisons by Principal Diagnoses Ranked on KID Data (weighted estimates, 1997

Rank[1]	CCS Category[2]	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
		C-NIS	NHDS	C-NIS	NHDS	C-NIS	NHDS
1	218: Liveborn	3,759 (58)	3,797 (142)	2.89 ** (0.03)	1.79 (0.11)	0.34 [a] (0.01)	0.34 (b)
2	128: Asthma	201 * (5)	231 (12)	2.48 (0.02)	2.90 (0.24)	0.02 [a] (0.00)	0.09 (b)
3	122: Pneumonia (except that caused by tuberculosis and sexually transmitted diseases)	198 (5)	212 (11)	3.67 ** (0.04)	1.20 (0.12)	0.31 [a] (0.02)	0.28 (b)
4	125: Acute bronchitis	151 ** (3)	190 (10)	3.09 ** (0.02)	0.78 (0.09)	0.05 [a] (0.01)	0.20 (b)
5	55: Fluid and electrolyte disorders	91 (3)	101 (7)	2.30 (0.02)	1.92 (0.21)	0.09 [a] (0.01)	0.00 (b)
6	142: Appendicitis and other appendiceal conditions	77 (1)	86 (6)	3.29 [a] (0.02)	0.60 (b)	0.01 [a] (0.00)	0.00 (b)
7	69: Affective disorders	72 (4)	79 (6)	7.76 [a] (0.17)	0.35 (b)	0.00 [a] (0.00)	0.00 (b)
8	224: Other perinatal conditions	62 (2)	69 (5)	6.78 ** (0.14)	3.08 (0.35)	1.62 [a] (0.10)	1.08 (b)
9	126: Other upper respiratory infections	62 (1)	72 (5)	2.21 (0.03)	2.41 (0.29)	0.03 [a] (0.01)	0.00 (b)
10	193: Trauma to perineum and vulva	61 ** (1)	0 (0)	1.85 [a] (0.01)	0.00 (b)	0.00 [a] (0.00)	0.00 (b)

[1] *C-NIS rank is based on number of discharges.*

[2] *Diagnoses classified according to Clinical Classifications for Health Policy Research, Version 2 (see Elixhouser and McCarthy, 1996).*

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

[b] *The NHDS sample size was too small to calculate a valid estimate of standard error.*

* *Difference is significant at the 0.05 level.*

** *Difference is significant at the 0.01 level.*

Table 32: KID and NHDS Comparisons by Principal Diagnoses Ranked on KID Data (weighted estimates), 1997 (continued)

Rank[1]	CCS Category[2]	Number of Discharges in Thousands (Standard Error)		Average Length of Stay in Days (Standard Error)		In-Hospital Mortality Rate: Percent (Standard Error)	
		C-NIS	NHDS	C-NIS	NHDS	C-NIS	NHDS
11	83: Epilepsy, convulsions	60 ** (2)	37 (4)	2.81 ** (0.04)	6.95 (0.89)	0.20 a (0.02)	0.00 (b)
12	7: Viral infections	59 (2)	56 (5)	2.72 ** (0.03)	4.58 (0.53)	0.04 a (0.01)	0.00 (b)
13	135: Intestinal infection	57 * (1)	71 (5)	2.55 * (0.03)	2.00 (0.25)	0.01 a (0.01)	0.97 (b)
14	196: Normal pregnancy and/or delivery	56 ** (1)	324 (15)	1.75 ** (0.01)	0.45 (0.05)	0.01 a (0.01)	0.07 (b)
15	154: Noninfectious gastroenteritis	55 ** (1)	70 (5)	2.08 * (0.02)	2.78 (0.32)	0.02 a (0.01)	0.41 (b)
16	159: Urinary tract infections	52 (1)	59 (5)	3.47 a (0.03)	0.39 (b)	0.03 a (0.01)	0.00 (b)
17	181: Other complications of pregnancy	41 ** (1)	22 (3)	2.32 a (0.02)	5.90 (b)	0.04 a (0.01)	0.00 (b)
18	45: Maintenance chemotherapy, radiotherapy	39 ** (2)	28 (3)	3.60 a (0.06)	0.84 (b)	0.11 a (0.02)	0.00 (b)
19	233: Intracranial injury	38 (1)	39 (4)	4.97 (0.15)	4.84 (0.64)	5.14 a (0.18)	3.95 (b)
20	230: Fracture of lower limb	36 * (1)	45 (4)	4.51 a (0.06)	1.80 (b)	0.04 a (0.01)	0.00 (b)

[1] *C-NIS rank is based on number of discharges.*

[2] *Diagnoses classified according to Clinical Classifications for Health Policy Research, Version 2 (see Elixhauser and McCarthy, 1996).*

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

[b] *The NHDS sample size was too small to calculate a valid estimate of standard error.*

* *Difference is significant at the 0.05 level.*

** *Difference is significant at the 0.01 level.*

Discussion

In comparisons with the pediatric discharges from the NHDS, KID discharge estimates generally agreed, while average length-of-stay estimates were mostly longer. Statistical comparisons were not possible for most in-hospital mortality rate estimates because the NHDS standard errors were not available due to sample size restrictions. KID discharge estimates were generally in line with pediatric discharge estimates from the NHDS. Overall there was no difference between the discharge estimates from the two samples, nor were differences found across the majority of comparisons by sub-category. Significant differences found were split fairly evenly between instances where the KID estimate was higher than the NHDS estimate and instances where the KID estimate was lower.

Areas where KID discharge estimates were not in line with NHDS estimates were hospital control, hospital bedsize, and diagnosis groups. Some of these differences may be signs of KID strengths. Compared to the NHDS, the KID estimates fewer discharges of whites and more discharges of other races.

One third of the discharge differences occurred in comparisons by hospital control and bedsize. No statistical comparisons were possible for in-hospital mortality rates by hospital-control. Comparisons of KID and NHDS estimates by hospital bedsize are shown in Table 23. Significant differences were found for many of the discharge and average length-of-stay estimates, while no statistical comparisons were possible for in-hospital mortality rates. As shown previously in Table 7, the KID closely reflects the distribution of births reported in the AHA survey across all control and bedsize categories, which suggests that the KID discharge estimates by hospital control and bedsize should be close to the actual numbers. This is not surprising considering that the KID design is based on the AHA survey to reflect the hospital profile of the nation. Thus the KID might be a better tool for analyses that consider hospital bedsize.

Average length-of-stay estimates from the KID were mostly longer than the estimates from pediatric cases in the NHDS. Overall the KID estimate, at nearly 3.5 days, was more than 50 percent longer than the NHDS estimate. Because valid standard errors were not available for all NHDS estimates (see Appendix), close to half of the potential comparisons were not possible. Of the statistical comparisons that were made, nearly all indicated significant differences between the two samples. KID estimates were longer than NHDS estimates in most of these differences.

AHA data in Table 10 shows that large hospitals tend to have more complex cases with more surgical procedures and longer stays than small hospitals. Our analysis suggests that the pediatric NHDS sample over-weights pediatric discharges from small hospitals, and under-weights discharges from large hospitals; while the KID more closely reflects the numbers of discharges by hospital size in the AHA. This is probably one of the reasons that the KID average lengths-of-stay estimates are higher than the average length-of-stay estimates for children in the NHDS. The strong representation of children's hospitals in the KID may also contribute to longer average length-of-stays. The KID estimate of discharges from children's hospitals is comparable to the AHA count of children's hospital discharges. In the KID, discharges from children's hospitals are more complex, with more surgical procedures and longer lengths-of-stay, on average, than discharges from other hospitals. Average length-of-stay estimates from the NHDS might be too low if the NHDS under-weights discharges from children’s hospitals. Determining the extent to which children's hospitals were represented in the NHDS was not possible, however.

Conclusion

In summary, the KID estimates of discharge counts appear unbiased in most contexts, and many of the differences found may be indicative of KID strengths. Compared to the NHDS, the KID is more reflective of the hospital composition of the AHA. Average length-of-stay estimates from the KID were consistently longer than estimates from the NHDS. These length-of-stay differences may be due to restricted NHDS sample size and differences in the types of patients from the two samples. With regard to hospital size and children's hospitals, the mix of KID hospitals is more representative of the hospital universe (as defined by the AHA) than is the NHDS. As a result, the patient case mix in the KID is probably more complex than the patient case mix in the NHDS. The restricted NHDS sample may over emphasize outlier values in smaller subgroups – several of the length-of-stay estimates for DRGs do not have face validity. It appears that KID estimates of in-hospital mortality rates were consistent with NHDS estimates, but statistical comparisons of in-hospital mortality rates were generally not possible because the NHDS restrictions on standard error calculations. In short, national estimates using the KID appear to be reliable and unbiased.

Appendix 1

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 is significant if

$$\textit{absolute value}\left(\frac{X-Y}{\sqrt{SE_X{}^2 - SE_Y{}^2}}\right) \geq S$$

where SE_X is the estimated standard error for the NIS estimate and SE_Y is the estimated standard error of the NHDS estimate. S is equal to 1.96 for significance at the .05 level and S is equal to 2.576 for significance at the .01 level.

If a valid estimate of either standard error, SE_X or SE_Y, could not be obtained, then a significance test was not performed.

Estimates of Standard Error for NHDS Statistics

A variety of statistics were estimated based on these data: 1) total number of discharges, 2) in-hospital mortality, and 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, constants a and b were obtained for 1997. The relative standard error for the estimate of total discharges is approximated by:

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

where W_{TD} is the weighted sum of total discharges (i.e., the estimate of total 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 is TLOS, and

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

then the relative standard error is:

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

This estimate of the relative standard error is valid only if:

(1) the relative standard error of the denominator (estimated discharges) is less than 5 percent, or

(2) both the relative standard error of the numerator (estimated total stay days) and the denominator (estimated discharges) are less than 10 percent.

Percent Mortality

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

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

Where b is the parameter b in the formula for approximating *RSE*(W_{TD}) given by the NHDS documentation. This estimate of the relative standard error is valid only if:

(1) the relative standard error of the denominator (estimated discharges) is less than 5 percent, or

(2) both the relative standard error of the numerator (estimated number of deaths) and the denominator (estimated discharges) are less than 10 percent.

Appendix 2: Errata

Sample Sizes (unweighted numbers of cases) – By Diagnoses, 1997

Strata	Reported KID Discharges	Actual KID Discharges
218: Liveborn	675,290	675,290
128: Asthma	86,698	86,698
122: Pneumonia (except caused by tuberculosis and STD)	77,936	77,936
125: Acute bronchitis	62,491	62,491
55: Fluid and electrolyte disorders	38,630	38,630
142: Appendicitis and other append conds	35,490	35,490
69: Affective Disorders	28,681	28,681
224: Other perinatal conditions	26,416	26,416
126: Other upper respiratory infections	25,872	25,872
193: Trauma to perineum & vulva	27,059	27,059
83: Epilepsy, convulsions	25,836	25,836
7: Viral infections	24,688	24,688
135: Intestinal infection	*23,524*	*22,306*
196: Normal pregnancy and/or delivery	*22,306*	*23,524*
154: Noninfectious gastroenteritis	*21,794*	*21,775*
159: Urinary tract infections	*21,775*	*21,794*
181: Other complications of pregnancy	*17,033*	*16,550*
45: Maint chemotherapy, radiotherapy	*16,550*	*16,162*
233: Intracranial injury	*16,194*	*17,033*
230: Fracture of lower limb	*16,162*	*16,194*

References

[1] Kozak L.J. Underreporting of race in the National Hospital Discharge Survey. Advance data from vital and health statistics; no 265. Hyattsville, Maryland: National Center for Health Statistics. 1995.

[2] Kozak, L.J. and Lawrence, I. *National Hospital Discharge Survey: Annual Summary, 1997*. National Center for Health Statistics. Vital Health Stat 13(144). 1999.

[3] Elixhauser, A. and McCarthy, E. *Clinical Classifications for Health Policy Research, Version 2: Hospital Inpatient Statistics*. (AHCPR Publication No. 96-0017) Agency for Health Care Policy and Research, Healthcare Cost and Utilization Project (HCUP) Research Note 1. February 1996.

[4] Kozak, L.J. and Lawrence, I. *National Hospital Discharge Survey: Annual Summary, 1997*. National Center for Health Statistics. Vital Health Stat 13(144). 1999.

[5] *Resident Population Estimates of the United States by Sex, Race, and Hispanic Origin: April 1, 1990 to July 1, 1999, with Short Term Projection to May 1, 2000*. Population Estimates Program, Population Division, U.S. Census Bureau, Washington, DC. 20233