National Hospital Discharge Survey (Revised 10/02/08)

0920-0212

(Expiration date: 08/31/08)

B. Collections of Information Employing Statistical Methods

1. Respondent Universe and Sampling Methods

Current NHDS

The NHDS has been collecting data annually since 1965. The NHDS universe consists of non-institutional, non-Federal hospitals in the 50 States and the District of Columbia which have six or more beds staffed for inpatient use and are a general hospital or have an average length of stay for all patients of less than 30 days. From 1988 until 2003, the hospital sampling frame for the current NHDS design was constructed from the SMG Hospital Market Database. Beginning in 2003, the sample frame was constructed from the products of Verispan, L.L.C., specifically its "Healthcare Market Index" and its "Hospital Market Profiling Solution". These products were formerly known as the SMG Hospital Market Database.

The initial current sample of hospitals was selected in 1987 from the 1987 SMG data file. That sample was updated in 1991, 1994, 1997, 2000, 2003, and 2006. The 2006 sampling frame included 6,101 NHDS-eligible hospitals.

The NHDS uses a modified three-stage design. The first stage consists of hospitals of 112 primary sampling units (PSUs) that comprise a probability subsample of PSUs used in the 1985-94 National Health Interview Survey (NHIS) (OMB 0920-0214). The PSUs are counties or groups of counties or county equivalents or towns and townships (some PSUs in New England and Hawaii). The PSU strata were defined within four geographic regions by number of people in the 1980 Census of Population and NHIS stratification variables. From each stratum, the PSUs were selected with probability proportional to the projected 1985 population.

The second stage consists of systematic random samples of additional hospitals selected from the sample PSUs with probability proportional to their annual numbers of discharges. Primary or secondary strata of hospitals were defined by four geographic regions, by PSU size (1980 Census of population and number of hospitals), by whether the hospital subscribed to a commercial abstracting service, by PSU, by whether the hospital participated in the 1987 NHDS, and by hospital specialty and bed-size class. Finally, hospitals were arrayed within strata by numbers of discharges occurring annually at the hospitals and then sampled. The sampling rates were such that at least three hospitals were selected to the initial sample from every PSU containing three or more eligible hospitals in the 1987 SMG file. In PSUs with fewer than three hospitals, all hospitals in the PSU were selected.

The hospital sample was updated in 1991 by continuing the sampling process among hospitals which were NHDS-eligible for the sampling frame in 1991, but not in 1987. That is, the additional

hospitals were added at the end of the list for the strata to which they belonged, and the systematic sampling was continued as if the additional hospitals had been present during the initial sample selection. Hospitals which were no longer NHDS-eligible were deleted. The same updating process was used in 1994, 1997, 2000, 2003, and 2006.

The 2006 sample included a total of 501 hospitals from the 6,101 listed in the 2006 sampling frame. Of these, 23 were found to be out-of-scope for NHDS and 40 others were non-respondent in 2006. The final respondent sample for 2006 included 438 hospitals and about 376,000 discharges. The sample for the 2007 data collection is similar to that for the 2006 survey.

Due to budget constrains, the samples size for the 2008 and 2009 data collections will be reduced to 239 hospitals (103 automated hospitals and 136 manual hospitals). The sampling frame for the reduced sample consisted of the 2006 NHDS sample minus hospitals that were confirmed out of scope. The reduced sample was designed to preserve region and hospital sampling strata and spread the sample across both the periodic birth samples and the original 1988 sample.

The third stage consists of a systematic random sample of discharges from each hospital. For hospitals using the manual system of data collection, hospital staff or NCHS field representatives from the Bureau of the Census select sample discharges from lists (daily listing sheets, computer files, or other lists) in which discharges are listed in some chronological order.

For hospitals using the automated system of data collection, NCHS selects the sample discharges from computerized discharge medical abstract files obtained from abstracting service organizations and state data systems. Before systematically sampling them, the records are sorted on the first two digits of the ICD-9-CM code of the first-listed diagnosis, patient age group at time of admission (under 1 year, 1-14 years, 15-44 years, 45-64 years, 65-74 years, 75-84 years, 85 years and over, and age unknown), gender, and date of discharge.

The third stage sampling rates are determined by the hospital's sampling stratum and the system (manual or automated) used to collect data from the hospital. One percent and five percent of the discharges in the certainty hospitals are selected under the manual and automated data collection systems, respectively. Except for certainty hospitals, sample sizes of 250 discharges each are targeted from all manual system hospitals and small automated system hospitals (fewer than 4,000 discharges annually according to sampling frame data). Samples of 2,000 are targeted from each of the remaining non-certainty automated system hospitals.

Redesigned NHDS

In 2010, the redesigned NHDS universe will consist of all non-institutional, non-Federal hospitals in the 50 States and District of Columbia which have 6 or more beds staffed for inpatient use. The redesigned NHDS will no longer use average length of stay as an exclusion criterion, nor require that the hospitals be general hospitals. The sampling frame will continue to be constructed from the Verispan, L.L.C. “Healthcare Market Index” and “Healthcare Market Profiling Solution”. These are the products formerly known as the SMG Hospital Market Database.

An initial sample of 30 hospitals will be selected for the pretest, scheduled for October 2008. These

hospitals will not be a probability sample, but instead will be intentionally selected to include hospitals of differing size, location, and other characteristics related to their service and payment clientele. Because of wide variation in hospital characteristics and resources, this variation is necessary for our pretest sample to assure that operational survey procedures being tested are effective in hospitals of many types and varying characteristics.

Specifically, service types included in the pre-test will include the breadth of service types that will be included in the 2010 national survey, including general acute care hospitals, children's hospitals, rehabilitation hospitals, psychiatric hospitals, critical access hospitals, long-term acute care hospitals, drug and alcohol treatment inpatient facilities, and specialty surgical hospitals. In addition to service type variation, variation in hospital size was considered a priority in choosing our sample. Geographic variation between metropolitan and non-metropolitan, as well as across different regions of the country, was deemed important as well. To the extent possible, we attempted to assure that hospitals with different permutations of the above variables were represented. For example, both large and small hospitals within metropolitan and non-metropolitan areas were represented. The distribution of hospitals throughout these variable groups is shown in Table I below.

Of note, hospitals with characteristics that scarcely exist in the universe of hospitals in the U.S., such as very large hospitals in rural areas, were not represented in the pretest sample. The hospital universe used for this analysis and for selection of the pretest sample was the 2007 Verispan data file. The 2007 sampling frame includes 6,400 NHDS eligible hospitals.

To assure participation of 30 hospitals in the pretest, we not only sampled 30 primary hospitals which were targeted for inclusion in the survey, but also sampled an additional 30 "backup" hospitals. The backup hospitals are stratified into the same service-type/ bedsize categories used to organize the 30 primary hospitals, assuring that the variation in hospital characteristic will be retained if some hospitals choose not to participate in the pretest. The distribution of backup hospitals across the hospital categories can also be seen in Table I below.

Table I: Distribution of Hospitals in the NHDS Pretest by Service Type, Bedsize, and Geographic Region

PRETEST HOSPITALS FOR NHDS				5 Geographic Regions				
Service Type/Bedsize	# Primary Hospitals (P)	# Backup Hospitals (B)		North-east	Upper Midwest	South-east	South Central	West
GENERAL HOSPITALS								
METROPOLITAN AREAS								
Under 100 beds	1	2		**B, B**			**P**	
100-299 beds	2	2		**P**	**P**		**B**	**B**
300-499 beds	3	3		**P**	**B**	**P, B**		**P, B**
500+ beds	4	4		**P, B**	**P, B**	**P, B**	**B**	**P**
NON-METROPOLITAN AREAS								

Critical Access Hospital (CAH)	2	2			**P, B**	**B**	**P**	
Under 100 beds (Not CAH)	3	3		**P, B**	**B**	**P, B**	**P**	
100-299 beds	2	1		**P**		**P**		**B**
SPECIALITY HOSPITALS	2	2			**P**	**P**	**B,B**	
WOMEN'S HOSPITAL	1	1			**B**			**P**
LONG-TERM ACUTE CARE HOSPITALS	2	2			**P**	**P, B**		**B**
CHILDRENS HOSPITALS	2	2			**P, B**		**B**	**P**
REHABILITATION HOSPITALS	2	2			**P, B**		**B**	**P**
PSYCHIATRIC HOSPITALS	3	3		**B**	**P, B**	**B**	**P**	**P**
ALCOHOL/DRUG HOSPITALS	1	1		**B**			**P**	
	30	30		**5 P/ 6 B**	**8 P/ 8 B**	**6 P/ 6 B**	**5 P/ 6 B**	**6 P/ 4 B**

*"P" designates a primary hospital and "B" designates a backup hospital.
**Hospitals with primary designation are those targeted for inclusion in the survey. The additional 30 hospitals with a backup designation are to be used in the event of refusal by the primary hospitals within each service type/bedsize category listed in the left-most column.

For the 2010 and 2011 NHDS, a sample of 240 hospitals is targeted. This will be an entirely new sample drawn from the 2008 Verispan data file. The redesigned NHDS will use a modified two-stage design, rather than the three-stage design used in the current survey. No geographic Primary Sampling Units (PSU) will be used in this design, and there will be no certainty hospitals defined a priori. First stage sampling units will be hospitals, selected from a stratified list of hospitals in the Verispan sampling frame. Primary strata will be defined by hospital service type, bedsize grouping, and location type (central city, fringe, small MSA, non-MSA). Within these strata, hospitals will be arrayed by Census region and hospital ownership. Hospitals will then be selected with probabilities proportional to their annual number of discharges. Hospital are anticipated to remain in the survey for a number of years.

The second stage of sampling will be within hospitals. A stratified, random sample of 120 discharges is targeted within each of the 240 sampled hospitals. For the pretest, hospital discharge lists will be stratified such that we will oversample deaths, acute myocardial infarction cases, hospital infections, and observation cases.[1] Normal newborn infants will be under sampled. We will be determining, during the pretest, whether hospitals have the capacity to conduct this kind of stratification for the 2010 and 2011 national surveys.

During the pretest, data will be collected on a sample of 10 discharges (8 inpatient; 2 observation) within each of 30 hospitals selected. Discharges will be selected for record abstraction using a

[1] Observation stays are discharges in which the patient was assigned to a hospital bed for a period of time (usually less than 24 hours) under medical supervision, without formal admission into the hospital.

stratified random sampling plan, which will require that hospitals' discharge listings be sorted (stratified) according to specific patient characteristics. Five strata will be constructed depending on the availability of information within the hospital to be used for stratification. The following strata are proposed: (1) observation stays, (2) normal newborn infants, (3) discharges with acute myocardial infarction (AMI), (4) inpatients discharged dead, and (5) other discharges. For the pretest, the composition of the sample selected within each hospital will be 2 observation cases, 1 normal newborn infant, 2 discharges with AMI, 1 death, and 4 not included in the other strata. For 2010, we anticipate a similar sampling scheme except that an average of approximately 10 discharges will be sampled each month for a total of 120 discharges (96 inpatient; 24 observation). These 96 discharges will represent only the newborn infants stratum and all other inpatient discharges. Additional records will be sampled if resources are available from outside sources to specifically examine discharges with AMI diagnoses or in-hospital deaths. We anticipate that sampling will actually be conducted every four months with a systematic sample of discharges taken where the discharges are arrayed by discharge date, thus ensuring a distribution of discharges across the months within each data collection period.

It is expected that the information needed to construct sampling strata will be available on discharge lists maintained by hospitals as determined from our feasibility test. Normal newborn infants and discharges with AMI will be identified on the basis of medical (ICD-9-CM) diagnostic codes, and in-hospital deaths will be identified on the basis of discharge status of the patient. Hospitals may have varying means for identifying observation cases in their discharge lists and this will be explored during the pretest.

Although we expect virtually all of the hospitals to be able to implement some type of stratified random sampling of discharges, if a hospital cannot stratify its discharge list, an unstratified, systematic sample of discharges will be selected during the pretest and the 2010 & 2011 surveys.

Sample Listing

Within each hospital, the information required for each sampling period includes the total number of discharges and observation status cases subjected to sampling in each discharge stratum and the total number of discharges selected from each discharge stratum (regardless of whether data are collected for those sampled discharges). The sampling period is composed of 4 months of discharges, so these items must be collected for that 4-month period.

To implement this sampling strategy, the contractor (RTI) will employ an individual to work with hospital staff to clarify, identify, and locate the information needed for stratification of the discharge lists. RTI will document any non-sampling errors, identified either during or after the sampling procedure is conducted.

2. Procedures for the Collection of Information

Current NHDS

Under a contractual arrangement with NCHS, the Bureau of the Census is delegated the responsibility for field activities associated with induction of hospitals into the survey and with data collection. Once a new hospital is identified and selected for the NHDS sample, a letter is sent to the hospital administrator from the Chief, Ambulatory and Hospital Care Statistics Branch, DHCS (Attachment H). Subsequently, an appointment is made with the hospital administrator and medical record administrator to discuss induction of the hospital into the survey. During a visit by a Bureau of the Census employee (or by telephone in the case of hospitals submitting tapes through abstract service organizations), the Hospital Interview Questionnaire (Attachment G 6) is completed and arrangements made for participation of the hospital in the NHDS. After induction, hospitals are periodically visited by a representative of the Bureau of the Census, at which time survey procedures are reviewed and information about the hospital is updated.

There are four basic data collection procedures used in the NHDS, two manual procedures (A and B) and two automated procedures (C and D):

A. Primary procedure - the sampling and abstracting of data, as well as the pulling and re-filing of the medical records, are done by hospital personnel. This procedure is followed by about 12 percent of the participating hospitals.

B. Alternate procedure - the sampling and abstracting of data are done by personnel from the Bureau of the Census; hospital personnel only pull sampled medical records and re-file them after the information has been abstracted. This procedure is followed by about 30 percent of the participating hospitals.

C. In-house tape or printout procedures - sampling and data generation are done using the hospital's in-house computer system. This procedure is followed by about 18 percent of the participating hospitals.

D. Abstract service procedure - tapes containing abstracts of hospital records are purchased from abstract service organizations or state data systems. Upon receipt of these tapes, NCHS selects the sample discharges. This procedure is followed by about 41 percent of the participating hospitals.

For the manual procedures (primary and alternate), discharge data are collected throughout the year. Sample discharges are systematically selected, usually on the basis of the final digit(s) of the patient's medical record number. Using the daily listing of discharges (or admissions) that the hospital has as a part of its routine recordkeeping requirements, the medical records falling into the sample are identified and listed on the Sample Listing Sheet (Attachment G 2).

For each sample discharge, an abstractor records demographic, administrative, diagnostic, and surgical information from the face sheet of the patient's medical record onto a Medical Abstract Form (Attachment G 1). Data collection frequency depends upon the arrangement made with the

hospital. In alternate procedure hospitals, a representative of the Bureau of the Census normally visits the hospitals bimonthly, completes the abstract forms for records selected during the previous visit, and selects records for abstracting at the next visit. This allows time for records to be completed and properly filed (or pulled from file) prior to the visit. In primary procedure hospitals, the same forms are completed by members of the hospital's medical record department. These forms are forwarded, with the Transmittal Notice (Attachment G 3), to one of the Census Regional Offices for review and then to the NCHS contractor for coding and data entry operations.

After transmittal from the hospital, abstract forms and printouts are subject to two reviews, two machine edits, and quality control procedures. Forms are reviewed for completeness at the Census Bureau Regional Offices and either forwarded to the NCHS contractor or returned to the hospital for more information. Upon receipt by the NCHS contractor, forms and printouts are again checked and, if necessary, returned to the Census regional office. After review, up to seven diagnoses and four procedures are coded according to the *International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)*. Demographic and coded information is then keyed from abstract to disk, and a preliminary machine edit program checks for missing, invalid, and inconsistent codes. The information is corrected, if necessary. The first quality control occurs at this stage. A ten percent sample of abstracts is selected, independently coded, and keyed. Using a computer match program, error rates are calculated for non-medical and medical information based on discrepancies in codes between the independent and the original coder.

When error rates exceed set standards for either non-medical or medical coding, the medical or non-medical information is recoded for the entire "batch" of abstracts and again subjected to the quality control procedures. Once the data file is received at NCHS, extensive computer editing is conducted to assure that all responses are accurate, consistent, logical, and complete. When necessary, records are reviewed manually to resolve inconsistencies. Missing age, gender, and length of stay data are imputed using a hot deck procedure which maintains known distributions by age, gender, and diagnoses.

For the in-house tape procedure, files containing medical record data are purchased from the hospital approximately every six months. The medical data are already coded and are only subject to NCHS editing and weighting processes.

For the abstract service procedure, files containing medical record data for sample hospitals are purchased from abstract services about every six months. The medical data are already coded and are subject to NCHS sampling, editing, and weighting processes.

Current Data Items

The Medical Abstract Form and the automated files contain items relating to the personal characteristics of the patient, including birth date, gender, race, and marital status but not name, address or SSN. The medical abstract form contains administrative information, including admission and discharge dates, and discharge status, and medical information, including diagnoses and surgical and non-surgical operations or procedures. Since 1977, patient ZIP Code, expected source of payment, and dates of surgery have also been collected. Beginning in 2001, type and source of admission were added. For the 2007 data collection, admitting diagnosis and present on admission indicators for the seven diagnoses the NHDS currently collects were added. (Patient ZIP Code, date of birth, and exact dates of admission and discharge are considered confidential information and are not available to the public.)

The Uniform Hospital Abstract Subcommittee of the U.S. National Committee on Vital and Health Statistics selected the Uniform Hospital Discharge Data Set (UHDDS) as a basic core of variables that would be of value to many potential users and that could be readily and reliably obtained. The U.S. National Committee on Vital and Health Statistics recommended in 1972 that UHDDS constitute the minimum basic data set for all hospital discharge abstracts. In 1974, the Secretary of the Department of Health, Education and Welfare approved the collection of the UHDDS for Medicare, Medicaid, and other Department programs, including the NHDS. The NHDS collects the items required by the UHDDS with one exception: "Physician identifier" is not included on the NHDS abstract.

Current Estimation procedures

Statistics from the current NHDS are derived by a multistage estimation procedure that produces essentially unbiased national estimates and has three basic components: (1) inflation by reciprocals of the probabilities of selection, (2) adjustment for non-response, and (3) population weighting ratio adjustments. The second and third components are made separately by admission type--that is, for discharges of newborns (whose hospital stay began at birth) and for discharges of other than newborns. Each component is briefly described in the following.

There is one probability associated with each stage of sampling: (1) the probability of selecting the PSU, (2) the probability of selecting the hospital, and (3) the probability of selecting the discharge within the hospital. The last probability varies with month, and is calculated to be the sample size from the hospital for the month divided by the total number of discharges occurring at the hospital that month. The overall probability of selection is the product of the probabilities at each stage. The inverse of the overall selection probability is the basic inflation weight.

NHDS data are adjusted to account for two types of non-response. The first type of non-response occurs when an in scope (NHDS-eligible) sample hospital is non-respondent for more than half of the months during which the hospital was in scope, thus becoming a non-respondent hospital. In this case, the weights of discharges from similar respondent hospitals are inflated to account for discharges represented by the non-respondent hospitals. For this purpose, hospitals are judged similar if they are in the same region, hospital specialty-size group, and, if possible, the same sampling stratum (i.e., the same abstracting status group if the non-respondent hospital is in the 12

largest PSUs and in the same PSU, otherwise). The adjustments for this non-response are made separately for admission type--that is, for discharges of newborns and for discharges of other than newborns. The adjustment consists of a ratio for which the numerator is the weighted number of discharges of the admission type in all similar sample hospitals (regardless of response status) and the denominator is the weighted total of discharges of that admission type from the similar respondent hospitals. Data on the number of discharges for each admission type for each hospital come from either the hospitals or the most recent Verispan "Healthcare Market Index" and "Hospital Market Profiling Solution" (formerly known as SMG Hospital Market Database).

The second type of non-response occurs when NCHS fails to collect all the discharge abstracts expected (the number expected is the product of the hospital's total discharges each month and the discharge sampling rate assigned to the hospital). In each month when the hospital was respondent (at least half the expected abstracts were collected), the weights of abstracts collected for the month are inflated to account for the missing abstracts. For a hospital's month(s) of non-response, the weights of discharges in the hospital's respondent months are inflated by ratios that vary with discharge groups defined by the ICD-9-CM diagnostic classes of those discharges' first-listed diagnoses.

The adjustment ratio for each partially respondent hospital and each discharge group is calculated using only data from sample hospitals which were both NHDS-eligible and respondent for all 12 months of the data year. The ratio has as its numerator the weighted sum of discharges in that discharge group for all months in which the partially respondent hospital was in scope, and has as its denominator the weighted sum of discharges in that discharge group which occurred in the months when the partially respondent hospital did respond to the NHDS.

Adjustments are made within each of 17 non-certainty hospital groups defined by region and hospital specialty-size classes to adjust for over- or under-sampling of discharges reported in the sampling frame for the data year. For discharges other than newborn infants, the adjustment is a multiplicative factor that has as its numerator the number of admissions reported for the year at sampling frame hospitals within each region-specialty-size group and as its denominator the estimated number of those admissions for that same hospital group. The adjustment for discharges of newborns is similar, but numbers of births are used in place of admissions. The ratio numerators are based on the figures obtained from the Verispan "Healthcare Market Index" and "Hospital Market Profiling Solution" (formerly known as the SMG Hospital Market Database) and the ratio denominators are obtained through a simple inflation of the Verispan figures for the NHDS sample hospitals.

Estimates of sampling variability are calculated with SUDAAN software which computes standard errors by using a first-order Taylor approximation of the deviation of estimates from their expected values.

Redesigned NHDS

Under a contractual agreement with NCHS, RTI International is responsible for developing all methods, procedures, instruments and materials for the NCHS redesign based on medical record

abstraction by RTI field staff using a PC-based data collection tool and a paper and pencil facility questionnaire.

Once a hospital is identified and selected for the NHDS redesign sample, RTI's health care consultant will send a letter to the hospital administrator from Edward Sondik, PhD., Director, NCHS (Attachment H1 and H2, pretest and 2010 surveys respectively). The data collection activities in the redesigned NHDS include hospital level data (using a facility questionnaire) and discharge-level data (using a PC–based discharge-level questionnaire):

1. Hospital level: RTI staff will utilize a three-part facility questionnaire to obtain information about the facility. Part A is a telephone screening to verify the facility's eligibility, Part B is an interview conducted between RTI and hospital personnel to obtain (among other things) systems information, general demographics, and key contacts, and Part C, in which hospitals are asked to provide us with detailed information on staffing and health information technology and payment, will be left for hospital staff to fill in (Attachment I).

2. Subsequent to discharge sampling the hospital staff will be asked to print out the UB-04 for sampled discharges and pull out other records. Using the printed UB-04, information in the medical, billing and laboratory records, RTI will abstract discharge information directly into the PC tool.

The hospitals will be offered several strategies for sampling. 1) Hospitals may generate a list of discharges stratified by the diagnosis groups described above, and NCHS will sample the records; 2) hospitals may generate a list of discharges and sample the records themselves; or 3) hospitals may send NCHS an electronic file listing all discharges, and NCHS will sample the records at NCHS. Options 1 and 3 are less burdensome to the hospital, but some hospitals may prefer to conduct the sampling themselves. For these hospitals (option 2), RTI will provide hospital staff with detailed instructions and training materials for implementing the stratified, random sampling methodology within their hospital (Attachment V). RTI will have already determined a point of contact to facilitate discharge sampling. In addition to sampling specifications, each hospital will also be provided with a sampling listing sheet to record relevant sampling information needed for use in the estimation process. This includes, but is not limited to the number of discharges by stratum, number of sampled discharges by stratum, number of complete/incomplete abstractions by stratum with reason, aggregate hospital statistics, such as total admissions (excluding newborn infants), total discharges (including newborn infants), and total number of beds (excluding bassinets). This information will be used in developing survey weights.

After induction, for hospitals that chose to sample themselves, RTI will monitor the sampling of discharges by the hospital to ensure sampling is being done correctly. RTI will also conduct and monitor all data abstraction from hospital records and schedule visits for field staff to each location on a 4-month basis or some other time increment agreeable to the hospitals. Hospital information will be updated at this time as well.

Redesign Data Items

Below are data elements we are examining in the pretest. If we find we cannot collect some of these then we will let OMB know.

The discharge level data will be abstracted under contract at no burden to the hospital.

Discharge level
The patient abstract form variables, to be obtained via data abstraction using the PC-based instrument are the following:

- Personal patient identifiers (name, address, last 4 digits of social security number, medical record number, Medicare/Medicaid number)
- Patient demographics (gender, birth date, race, and ethnicity)
- Source of admission
- Status/Disposition of the patients at discharge
- Admission date
- Discharge date
- Medications: pre-admission and at discharge
- Admitting diagnosis
- Expected sources of payment
- Principal diagnoses
- Other diagnoses
- Principal procedures
- Other procedures
- Clinical laboratory results (including hematocrit, white cell count, platelet count, sodium, potassium, urea nitrogen, and creatinine)
- Height and weight
- Birth statistics (birth weight, mother's date of birth or mother's age)
- Financial and billing record data including revenue codes indicating ICU utilization, National Provider Identifier (NPI), and overall payment for hospitalization
- Other hospital care within 30 days prior to admission and following discharge

The patient abstract form for the pretest also will include questions for three modules: acute myocardial infarction, end of life care, and infectious diseases, and include the following:

Acute myocardial infarction

- Date and time of first hospital contact
- Troponin levels
- Ischemic pain upon admission
- Elective (planned) cardiac procedure admission

End of life

- Advance care plan present on admission
- "Do not resuscitate" order present

Infectious disease

- Any positive blood cultures for discharge during inpatient stay
- Date of first positive culture
- Name and ID[2] of organism corresponding to culture
- Central venous catheter in place within 2 days before culture

The patient abstract form is in Attachment L for the pretest and Attachment P for the National Survey.

Facility Level

The facility questionnaire (Attachment I for pretest and Attachment N for the National Survey) is divided into three parts:

Part A is a telephone screening call to determine the hospital's eligibility and to obtain a hospital point of contact to send introductory material about the pretest and national survey.

Part B is an interview and includes questions about location and access to data for sampling and abstraction, data sources and identifies key contacts. Questions include:

- If a hospital refuses to participate, then what are the hospital's concerns about participating and questions about its IRB process
- If hospitals agree to participate in the pretest, they are asked:
    - Health care system information
    - General hospital characteristics (e.g., bedsize and staffing)
    - Record sampling and identification
    - Financial and billing information
    - Institutional Review Board information, if needed
    - Key hospital contacts

Part C collects hospital facility information and includes questions on:

- Hospital characteristics (e.g., total number of inpatient days, number of operating rooms, hospital ownership type)
- Clinical capabilities and services (e.g., does hospital provide adult cardiac surgery, have a palliative care program)
- Financial information (distribution of total revenue from patient care by patient insurance type)

[2] National Healthcare Safety Network pathogen code

- Emergency department (does the hospital have an ED? what is the trauma level rating of the ED?)
- Numbers of full time employees (FTEs) for the nursing and physician assistant staff
- Health information technology (which areas of the hospital do HIT function?)
- Electronic medical record (EMR) used in which direct patient care settings?

Part C of the facility questionnaire will also include questions about the two modules: acute myocardial infarction and infectious disease.

Infectious Disease

- Cumulative susceptibility data to specific antibiotics for inpatients for 12 months on four bacteria.

AMI

- Does the hospital have clinical capabilities and services for adult cardiac catheterization, adult interventional cardiac catheterization, and adult cardiac surgery?

Redesign Estimation Procedures

Estimation based on the sampled discharges will involve calculating weights to be used to inflate sample records to national statistics. Sampling weights will be derived by a multistage estimation procedure that has three basic components: (1) inflation by reciprocals of the probabilities of selection, (2) adjustment for non-response, and (3) calibration based on auxiliary information available from other sources.

For component (1), the overall probability of selection is the product of the probabilities at each stage of sampling, namely, the probability of selecting the hospital, and the probability of selecting the discharge within the hospital. The inverse of the overall selection probability is the basic inflation weight. Selection probabilities for discharges within hospitals will vary by hospital and by sampling stratum. Discharge sampling rates will be calculated annually, based on hospital statistics from the previous calendar year. One annual rate per stratum will be computed, potentially resulting in 5 sampling rates to be applied across the entire survey year. The discharge sampling rate is the inverse of the discharge sampling interval, which will be calculated by taking the total number of discharges within a stratum (as reported for the previous year) and dividing by the targeted sample size for that stratum. For hospitals that are not able to stratify their discharge list, then a single annual discharge sampling rate will used to select discharges from an unstratified discharge list. Prior to calculating the annual sampling rate, hospitals will be asked whether they anticipate any major changes in inpatient volume in the upcoming year, such as, for example, opening or closing a wing or adding a special unit. If major changes are planned or anticipated, then it may be necessary to recalculate the sampling rate during the year.

Non-response adjustment will be applied to account for two types of non-response: (1) hospital non-response, which occurs when an in scope, sample hospital does not respond for more than half of the months during which it was in scope, thus rendering it a non-respondent, and (2) incomplete response within hospital, which occurs when at least half, but not all, of the total number of discharge abstracts expected to be collected for a given time period are collected.

If discharges sampled from hospital blood culture listings for the supplemental stratum are retained in the final design, weights for that sample will be computed and used in estimates of hospital-acquired infections.

Estimates of sampling variability will be calculated with SUDAAN software, which computes standard errors by using a first-order Taylor approximation of the deviation of estimates from their expected values.

Degree of Accuracy

The sample size of the redesigned NHDS will be reduced to approximately 24,000 records within 240 hospitals in order to collect much greater detail for each record. However, preliminary analyses, using data from the current NHDS and assuming 80 percent of sample hospitals participate, suggest this sample size will be sufficient to produce reliable estimates of the frequency of hospitalizations for a range of important diagnoses and demographic groups. Under NHDS guidelines, an estimate is considered reliable if its percent relative standard error (RSE) is less than 30 percent.

Depending on the clustering of specific diagnoses or demographic groups within strata for likely hospital sampling designs, different percent statistics can be estimated at different levels of precision. Still, hospitalizations for asthma, a 1.4% statistic, will likely have a percent RSE of only 9.06%. Hospitalizations for depression or bipolar disorder, a 2.7% statistic, would have a percent RSE of 10.7%. These are well below NHDS's RSE guide for reliability. Even if fewer than expected hospitals participate, reliability would still be acceptable for many groups. For additional estimates for specific targeted groups, please see Attachment Q.

In addition, the redesigned survey will provide the opportunity for making facility level estimates. At the facility level, RSEs are likely to be larger than at the discharge level for a fixed percent magnitude, but for larger percent statistics, facility level estimates can reliably be made. For example, Ownership by State or Local Government, a 23.5% statistic, can be estimated with a percent RSE of 18.3%. This is believed acceptable because facility characteristics are likely to have fewer categories and, thus, higher frequency percents in each category than discharge level data which can have, for example, any of thousands of different diagnoses. Although ownership of hospitals does not need to be estimated, as these data are available from other sources for the hospital universe, ownership provides an example of a hospital level variable with reasonably large percent statistics.

3. Methods to Maximize Response Rates and Deal with Non-response

Current NHDS

The overall hospital response rate for the 2006 NHDS was 92 percent. Of the 501 hospitals in the 2006 sample, 23 were found to be out of scope (ineligible) because prior to 2006 they went out of business or failed to meet the criteria for the NHDS universe. Of the 478 in scope hospitals, 440 hospitals responded (NCHS collected data for at least half of the number of sample discharges expected in half or more of the months these hospitals were in scope).

A number of methods are employed to gain the cooperation of hospitals which initially choose not to participate in the NHDS. For example, non-responding hospitals are telephoned annually by Bureau of the Census personnel in an attempt to set up a meeting to discuss the survey and gain their participation. Non-responding hospitals that subscribe to an abstract service organization or submit data to a state data system are encouraged to submit data using this medium. Hospitals with in-house computer capability are allowed to submit their data via tape or printout. Other methods used to increase participation include having representatives of Census rather than hospital personnel abstract the required data and reimbursing hospitals for abstracts that they complete.

With the implementation of the HIPAA Privacy Rule in April 2003, Hospital Care Statistics Branch staff developed materials, including a question and answer sheet, for the NHDS sampled hospitals to let them know that they could still participate in the NHDS and be in compliance with HIPAA.

Redesigned NHDS

The credibility of analyses based on the NHDS and ultimately of the programs, policies, and decision-making based on those findings rests on achieving an exceptionally high degree of cooperation on an ongoing basis among the sampled hospitals. RTI will use multiple methods for maximizing response rates. We are anticipating a response rate of 85% based on our experience with inducting birth hospitals into the current NHDS.

NCHS brings national credibility and influence by providing the introductory letter from Dr. Edward Sondik, Director, NCHS, and the NCHS Ethics Review Board approval letter. As part of the frequently asked questions developed for the pretest by the Ambulatory and Hospital Care Statistics Branch, several questions and answers are presented to inform sampled hospitals that they may participate in the pretest and national survey and be in compliance with HIPAA (Attachments M1 and M2).

Hospitals will be reimbursed $500 annually, upon completion of each full year of participation (12 months of data abstraction), to ease the administrative burden caused by the survey.

4. Tests of Procedures and Methods to be Undertaken

Current NHDS
Non-response studies are not planned for the current NHDS, which has maintained a response rate of at least 89 percent or better since 1988. It is expected that a response rate of 89 percent or better will continue through the 2008 and 2009 data collections. After this time, the redesigned NHDS will be implemented.

Redesigned NHDS

A pretest of the redesigned survey is planned and has been described in detail in earlier sections. If the redesigned NHDS response rate fails to be maintained at an acceptable level, we request the option of investigating potential causes of the increased non-response in an effort to develop corrective measures. If the NHDS response rate drops precipitously, instrument(s) and protocol(s) for such studies will be developed and submitted to OMB by change worksheet.

5. Individuals Consulted on Statistical Aspects and Individuals Collecting and/or Analyzing Data

The statistician responsible for the current and redesigned survey is:

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The person responsible for the data collection aspects of the redesigned survey is:

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The person responsible for the analytic aspects of the current and redesigned survey is:

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ATTACHMENTS

A: Legislative Authority To Collect Data On Hospital Utilization; Sections 306(A) And (B) Of the Public Health Services Act

B: Executive Summary of the Feasibility Study for the NHDS Redesign

C: Federal Register Notice for NHDS Redesign

D: List of Experts Consulted About the Redesign of the NHDS

E. RTI Data Security Plan (DSP)

F: Research ERB Approval Notice for the Current NHDS

G: 1. Medical Abstract for the Current NHDS
2. Sample Listing Sheet
3. Transmittal Form
4. Hospital Instruction Manual
5. Transmittal Notice
6. Hospital Interview Questionnaire

H1: Induction Letter for the NHDS Redesign Pretest
H2: Induction Letter for the NHDS Redesign 2010 Survey

I: Pretest Facility Questionnaire Form for the NHDS Redesign

J: Pretest Sample Listing Sheet for NHDS Redesign

K: Induction Letter for the Current NHDS

L: Pretest Patient Abstract Form for NHDS Redesign

M1: Frequently Asked Questions about the NHDS Redesign Pretest
M2: Frequently Asked Questions about the NHDS Redesign

N: National Survey Facility Questionnaire Form for the NHDS Redesign

O: National Survey Sample Listing Sheet for the NHDS Redesign

P: National Patient Abstract Form for the NHDS Redesign

Q: Estimated Relative Standard Errors NHDS Redesign

R1: Survey Presentation NHDS Redesign Pretest
R2: Survey Presentation NHDS Redesign 2010 & 2011 Surveys

S: NCHS ERB Approval Letter for the NHDS Redesign Pilot Study

T1: Pretest Survey Reabstraction
T2: National Survey Reabstraction

U: Debriefing Form

V: Discharge Sampling Manual for the Pretest