

ESTIMATING FROM A FACILITY SURVEY THE ANNUAL NUMBER OF INDIVIDUALS
WHO WERE ADMITTED TO AND DISCHARGED FROM A NURSING HOME

Steven L. Botman, National Center for Health Statistics

The 1985 National Nursing Home Survey (NNHS), conducted by the National Center for Health Statistics (NCHS), includes several design features not present in prior NNHS cycles. The NNHS is a multi-component sample survey providing statistics on nursing home use. In particular the NNHS provides statistics on the total number and distribution by various characteristics of current residents in nursing homes, nursing home discharges, and the nursing homes themselves.

Although no sample of admissions was included in the NNHS, the NNHS was to estimate the total number of nursing home admissions and of persons admitted to a nursing home. This paper describes the interplay among the NNHS sampling design, data requirements, data set, and counting rules for estimating admissions.

As for terminology, a nursing home stay begins with a person's admission; during this stay the person is a current resident; and the stay ends with the person's discharge. The length of the person's stay could be decades. A person is discharged either dead or alive. For the NNHS a nursing home refers to any facility providing nursing or related care.

For ease of presentation, first discussed will be the NNHS estimator for the annual number of persons discharged from a nursing home, a similar but simpler problem than that for admissions.

Some such statistics on nursing home usage could be obtained from NCHS population-based sample surveys, such as the National Health Interview Survey. Such population-based surveys, however, underestimate the number of persons receiving nursing home care. Population-based surveys exclude the deceased and institutionalized.

Section 1 provides background on the NNHS sampling and data collection plans. Section 2 discusses the main problem in estimating the annual total number of persons discharged from a nursing home: each year some individuals are discharged more than once from any nursing home--we want a (unduplicated) person estimate. This situation requires counting rules for estimation; see, for example, Sirken (1980). Section 3 discusses the NNHS estimator for the annual number of persons discharged. Section 4 describes the counting rules in the NNHS admissions estimator. Section 5 summarizes the paper.

Note, no reported NNHS unweighted count of sample discharges or current residents is based on a final data tape. The reported unweighted counts (along with derived proportions) of sample discharges and current residents are provisional.

Section 1: NNHS Sampling and Data Collection Plan

The 1985 NNHS is based on a stratified sample of 1,220 nursing homes. Shimizu (1986) discusses the details of the survey design. The NNHS sampling frame is a list of nursing homes identified in the 1982 National Master Facility Inventory (NMFI) updated through the Agency Reporting System as of June 1, 1984, homes identified in the 1982 NMFI

Complement Survey (all prior studies were conducted by NCHS), and institutional homes identified by the U.S. Health Care Finance Administration. The homes identified in the 1982 NMFI Complement Survey are a national area sample of homes eligible but not identified for the 1982 NMFI. The frame excludes places providing only board and care along with places with fewer than three beds. The frame also excludes homes in Alaska and Hawaii. Before sampling, the components of the sampling frame were merged and then duplicate listings were removed.

The first-stage NNHS sampling strata were formed using total staffed-resident bed size and certification status reported on the sampling frame. For stratification a nursing home was classified as certified if the frame indicated that the home was certified by either Medicaid or Medicare as a skilled nursing facility or an intermediate care facility.

A sample nursing home generally was selected proportional to the number of staffed beds reported in the frame where the beds were weighted by the reciprocal of the home's probability of being in the frame (probability is less than one only for a home identified in the Complement Survey). In each sampling stratum, NNHS nursing homes representing a large number of (weighted) staffed beds, however, may have been sampled with certainty.

Survey information for the current resident and discharge samples was obtained at each sample home by one interviewer if the home had fewer than 250 beds and 2 or 3 interviewers if the home had 250 or more beds. Survey staff obtained information for the sample current residents from an interview with nursing home staff who consulted the site's records. Information for sample discharges was similarly obtained. No patients were interviewed in a nursing home for the NNHS.

No separate sample of admissions was selected in part because NNHS data collection in each sample home was targeted to be completed in a single day. Data collection for a sample of admissions along with that for a sample of current residents and discharges would have required more than the one day in any home, regardless of the number of assigned interviewers. If at sample homes more than one day was targeted by NCHS for the completion of NNHS data collection, the total cost for the NNHS would increase. Moreover, there was concern that increasing the targeted data collection time in each home would adversely affect the Survey response rate.

To select the NNHS second-stage samples, interviewers compiled the sampling frames for current residents, discharges, and registered nurses; listed on the Current Resident Sampling List the individuals who were current residents of the facility on the evening prior to the day of the survey; listed on the Discharged Resident Sampling List the discharges from the facility for the 12 prior months; and listed on the Registered Nurse Sampling List the registered nurses working at the home.

In a nursing home the NNHS second-stage samples were composed of five current residents, six discharges, and four registered nurses, where available. By comparison the 1977 NNHS design allowed more variability than the 1985 NNHS in the second-stage sample sizes; up to eight discharges and eight current residents could be selected for the 1977 NNHS within home samples, although the 1977 NNHS second-stage samples averaged five to six current residents and four discharges. By reducing the variability in the 1985 second-stage NNHS sample sizes, NCHS was more confident that only one day would be required for NNHS data collection at a sample home.

The NNHS interviewer selected the sample discharges using tables that specified the line numbers on the Discharged Resident Sampling List selected for the sample. A set of sample line numbers was provided to the interviewer for each potential number of listed discharges. The interviewers used similar sampling tables to select the NNHS current resident and registered nurse samples from the Current Resident Sampling List and the Registered Nurse Sampling List, respectively. The survey contractor assigned to each sample home one of ten sets of these tables of sample line numbers determined by the terminal digit of the home's NNHS identification number. In homes with fewer than these numbers of current residents, discharges, or registered nurses, these sampling tables specified the selection of all current residents, discharges, and registered nurses for the NNHS sample.

Since many nursing homes operate at nearly full capacity and the NNHS frame data on the total number of staffed beds was recent, most NNHS sample current residents had the same overall probability of selection within a NNHS sampling stratum; however, sample current residents in different sampling strata had different probabilities of selection. On the other hand, the correlation between the total number of beds and the annual number of discharges was weaker. In different sample nursing homes, sample discharges and RN's did not have the same probability of sample selection, respectively.

Section 2: Problem in estimating the number of individuals with a nursing home discharge

The survey sponsors require NNHS estimates for the total annual number of admissions and estimates for the total annual number of persons admitted. For this paper the requirement first translates to NNHS estimates for the total number of discharges and to NNHS estimates for the total number of persons discharged from a nursing home. These analysis units differ. The NNHS estimator for these statistics requires that the NNHS data sets include certain information.

The 1985 NNHS yields a national probability sample of discharges from nursing homes, where multiple discharges by a person are distinct sampling units. During a year some persons have more than one nursing home stay--these stays may be in a single home or in several homes.

Thus without an adjustment for multiple nursing home stays, this sample overestimates the annual total number of persons discharged from a nursing home--it does not yield an unduplicated estimate.

Not known, for example, was whether persons with multiple stays might have less serious health problems than the persons only with a single stay.

While some persons were known to have multiple nursing home stays within a 12-month period, before the 1985 NNHS both the number and distribution of individuals with such multiple stays were not available. Several circumstances provide a rationale for multiple nursing home stays: For example, an individual could be transferred from one nursing home to another or an individual could periodically require nursing home care so the regular caretaker could have a respite.

Moreover some nursing home current residents require transfer to a hospital for health care. Whether a nursing home discharges a current resident who transfers to a hospital varies from home to home. To construct the sampling frames the NNHS used each sample home's determination of whether a person was admitted or discharged.

By way of background, NCHS encountered a similar problem in the design of the sample-based 1977-1980 National Reporting System for Family Planning Services (NRSFPS). The NRSFPS was based on a stratified two-stage sample of visits to family planning clinics, where the Survey was required to produce estimates of the annual number of persons with a visit to a family clinic. Information for the NRSFPS questionnaire was obtained from both facility records and patient interviews. Most family planning patients had multiple visits, with revisit frequency often related to prescribed contraceptive.

To estimate the annual number of persons with one or more visits, NCHS specified a counting rule in the NRSFPS where a sample visit contributed data to the person estimate if it was the individual's first visit during the calendar year. This fixes a one-to-one correspondence between persons who made a family planning visit and a subset of family planning visits (i.e., only those visits that correspond to the individual's first visit during the year). The NRSFPS estimated the annual number of family planning visits with this characteristic of interest, which by definition estimates the annual number of persons with a family planning visit.

For a similar problem in a two-stage equal probability sample, Sirken (1980) proposed estimators based on three counting rules. To estimate the number of individuals with one or more hospital discharges based on a theoretical hospital discharge survey, Sirken proposed three counting rules: Rule 1 links an individual to all of their discharges; rule 2 links an individual to all of their discharges from the first hospital discharging the individual during the 12 month period; and rule 3 links an individual to their first discharge during the calendar year. Sirken speculated that only the last two of the counting rules would be feasible, since they use information only on prior hospital stays except potentially for prior stays at the hospital first discharging the individual. It was not thought that a facility's records would include information about an individual's subsequent stays in other hospitals. The NNHS, however, did not yield equal probability samples, especially for discharges.

Section 3: Estimating the number of individuals who were discharged from a nursing home

To estimate the annual number of persons with a nursing home discharge, the NNHS linked the individuals to their first nursing home discharge during the 12-month period. This fixes a one-to-one correspondence between persons with one or more discharges and a subset of the discharges. The nursing home would be likely to know whether the patients in the NNHS discharge sample had a prior nursing home stay within the prior 12 months. Figure 1 shows the portion of the NNHS Discharged Resident Questionnaire that obtained information on prior nursing home stays.

Of the 6,035 NNHS responding sample discharges, about 9 out of 10 corresponded to the individual's first discharge for the 12 month period. NNHS estimates on the characteristics of persons with a discharge in the prior 12 months will be based on the records for these first discharges.

Section 4: Estimating the number of admissions

By definition every nursing home admission in the NNHS Survey year is uniquely linked to a stay at a nursing home. The stay may be ongoing or completed depending on whether the patient was discharged as of the survey date. For completed stays the admission is uniquely associated with the nursing home discharge for the stay. For ongoing stays the admission for the stay is uniquely associated with the current resident for the stay.

The probability sample of admissions for nursing home stays consists of admissions for the NNHS probability samples of current residents and discharged residents. The sample of admissions is constructed in two parts depending on whether the stay was completed. For stays not completed as of the survey date, the admission sample includes the admission for an NNHS sample current resident if the admission date for that current resident is in the 12 months prior to the survey date; for completed stays as of the survey date the admission sample includes the admission for the NNHS sample discharge if the admission date for that discharge is in 12 months prior to survey date. Note not all admissions for the sample current residents and discharges were eligible for the admissions sample.

This sample allows estimating the annual number of admissions to nursing homes. However, a problem similar to that noted in Section 2 exists if we need to estimate the number and distribution of individuals who had admissions in the survey year. Some individuals may have had more than one

stay in the survey year and thus have more than one admission in the survey year.

To estimate the annual number of individuals admitted to a nursing home, NCHS used a counting rule similar to that for the National Reporting Services for Family Planning Services described in Section 3. Each person is linked to the stay with their first admission in the 12 months prior to the Survey. This fixes a one-to-one correspondence between persons with an admission during the year and a subset of the admissions (i.e., only that admission that corresponds to the individual's first stay during 12 months prior to the survey date). Thus the NNHS estimator provides an estimate of the annual number of admissions with this characteristic of interest, which by definition estimates the annual number admitted.

Of the 6,035 responses to the NNHS discharged resident sample, about 2 out of 3 indicated that the admission corresponding to the stay was the individual's first in the NNHS survey year. Of the 5,253 responses to the NNHS current resident sample, about 1 out of 3 indicated that the admission corresponding to the stay was the individual's first in the NNHS survey year. NNHS annual estimates on the characteristics of persons who are admitted to nursing homes will be based on admissions corresponding to these stays. With these figures we could estimate the expected precision of admission statistics.

Section 5: Summary

The preceding sections outline the NNHS estimators for the annual number of persons with a nursing home admission or discharge. Also noted is the interplay among sample design, data requirements, data set, and counting rule.

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References

1. Shimizu, Iris M. "The 1985 National Nursing Home Survey Design," American Statistical Association, 1986 Proceedings of Survey Research Section (forthcoming).
2. Sirken, Monroe G. "Effects of Counting Rules on the Data Requirements in a National Hospital Patient Survey," American Statistical Association, 1980 Proceedings of the Social Statistics Section, 177-179.

Figure 1: Portion of the NNHS Discharged Resident Questionnaire obtaining information on prior nursing home stays.

11a. Other than the stay from (DATE OF ADMISSION) to (DATE OF DISCHARGE), has _____ had any other stays at this facility?

01 Yes
 02 No (SKIP TO INTERVIEWER NOTE AFTER Q. 11f)
 94 Don't know (SKIP TO INTERVIEWER NOTE AFTER Q. 11f)

11b. How many times has _____ been a resident in this facility besides the stay from (DATE OF ADMISSION) to (DATE OF DISCHARGE)?
 Times _____

11c(1). On what dates was _____ admitted and discharged from this facility?

	Admitted		Discharged		11c(2). Was this discharge to a short stay or general hospital?		
	month/day/year	month/day/year	month/day/year	month/day/year	Yes	No	Don't know
1.	_____	_____	_____	_____	01 <input type="checkbox"/>	02 <input type="checkbox"/>	94 <input type="checkbox"/>
2.	_____	_____	_____	_____	01 <input type="checkbox"/>	02 <input type="checkbox"/>	94 <input type="checkbox"/>
3.	_____	_____	_____	_____	01 <input type="checkbox"/>	02 <input type="checkbox"/>	94 <input type="checkbox"/>
4.	_____	_____	_____	_____	01 <input type="checkbox"/>	02 <input type="checkbox"/>	94 <input type="checkbox"/>
5.	_____	_____	_____	_____	01 <input type="checkbox"/>	02 <input type="checkbox"/>	94 <input type="checkbox"/>
6.	_____	_____	_____	_____	01 <input type="checkbox"/>	02 <input type="checkbox"/>	94 <input type="checkbox"/>
7.	_____	_____	_____	_____	01 <input type="checkbox"/>	02 <input type="checkbox"/>	94 <input type="checkbox"/>
8.	_____	_____	_____	_____	01 <input type="checkbox"/>	02 <input type="checkbox"/>	94 <input type="checkbox"/>

12a. Was _____ ever in any other nursing home beside this one?

01 Yes
 02 No (SKIP TO INTERVIEWER NOTE BEFORE Q. 13)
 94 Don't know (SKIP TO INTERVIEWER NOTE BEFORE Q. 13)

12b. Not counting this facility, in how many different nursing homes did _____ reside?

Number of different homes _____ 94 Don't know

12d. What is the name of each of the other nursing homes at which _____ was a resident or patient?

Facility

(1) _____
 (2) _____
 (3) _____

12e. How many times was _____ (NAME OF FACILITY IN Q. 12d(1))?
 Times in facility _____

12f. On what dates was _____ admitted and discharged from (NAME OF FACILITY IN Q. 12d(1))?

	Admitted		Discharged	
	Month	Year	Month	Year
1.	____/____	____/____	____/____	____/____
2.	____/____	____/____	____/____	____/____
3.	____/____	____/____	____/____	____/____