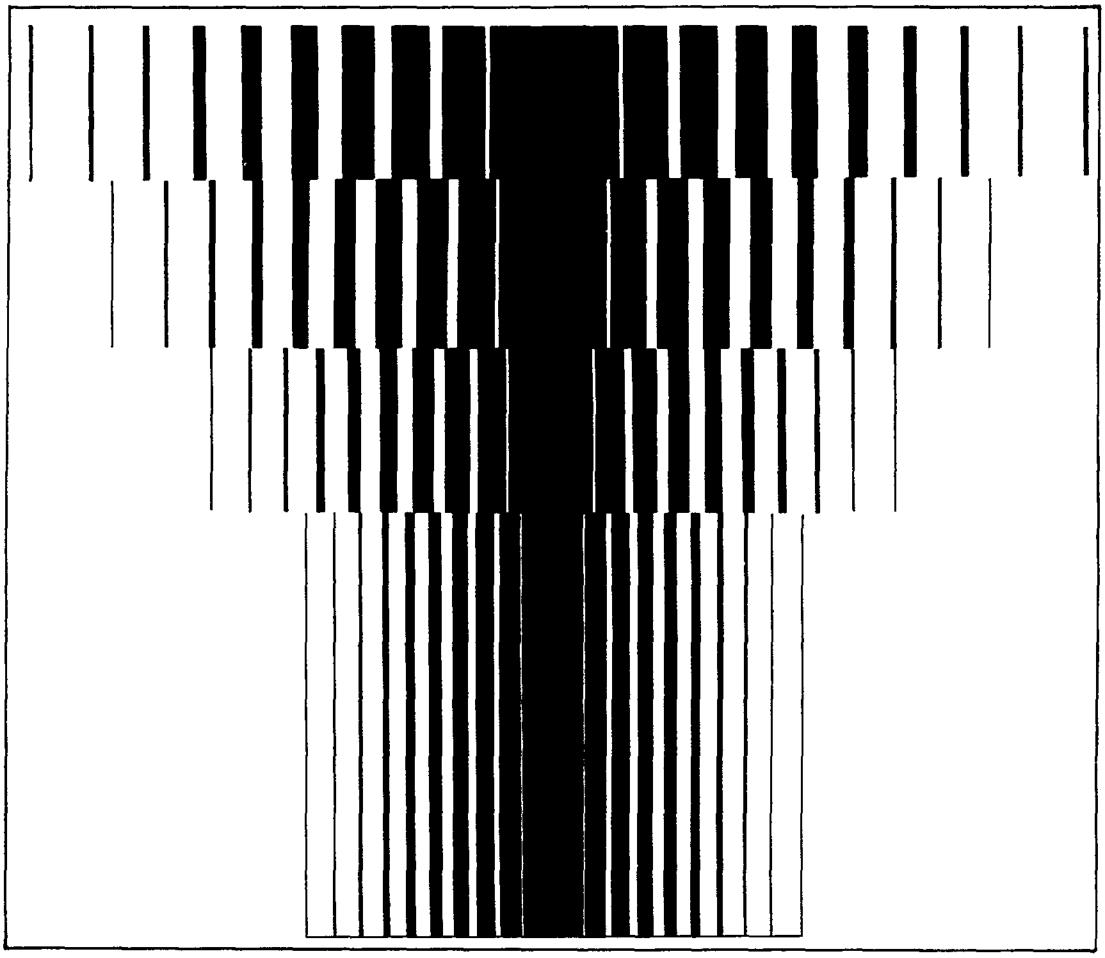
Utilization and Expenditures for Ambulatory Medical Care by People Hospitalized: United States, 1980

Series B, Descriptive Report No. 7



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Published by

Public Health Service
National Center for Health Statistics

April 1985

Suggested Citation

Bryant, E. E., and Biggar, R.: Utilization and expenditures for ambulatory medical care by people hospitalized, United States, 1980. Series B, Descriptive Report No. 7. DHHS Pub. No. 85–20207. National Center for Health Statistics, Public Health Service. Washington. U.S. Government Printing Office, Apr. 1985.

Library of Congress Cataloging in Publication Data

Bryant, E. Earl (Elmer Earl)
Utilization and expenditures for ambulatory medical care by people hospitalized, United States.

(National medical care utilization and expenditure survey. Series B, Descriptive report ; no. 7)
(DHHS publication ; no. (PHS) 85–20207)
Prepared by E. Earl Bryant and Ronald Biggar.
Bibliography: p.
1. Ambulatory medical care—United States—Utilization—Statistics. 2. Physician services utilization—United States—Statistics. 3. Medical care, Cost of—United States—Statistics. I. Biggar, Ronald. II. United States. Health Care Financing Administration. Office of Research and Demonstrations. III. National Center for Health Statistics (U.S.) IV. Title. V. Series. VI. Series: DHHS publication ; no. (PHS) 85–20207. [DNLM: 1. Ambulatory Care—economics—United States—statistics. 2. Ambulatory Care—utilization—United States—statistics. 3. Hospitalization—United States—statistics. WX 205 B915u]
RA410.7.B78 1985 362.1'2 85–7237
ISBN 0–08406–0297–9

Contents

Executive Summary 1
Introduction 2
Findings 4
  Insurance Coverage 4
  Living Arrangement 5
  Volume of Physician Visits 5
  Activity Limitation 5
  Expenditures for Prescribed Medicines 6
  Expenditures for Medical Care and Hospital Care 6
References 7
List of Detailed Tables 8
Appendixes
I. Technical Notes on Methods 17
II. Definition of Terms 24

Figure

1. Percent of population by type of health insurance coverage 4

Symbols

---	Data not available
...	Category not applicable
-	Quantity zero
0.0	Quantity more than zero but less than 0.05
*	Relative standard errors are 30 percent or more

Utilization and Expenditures for Ambulatory Medical Care by People Hospitalized: United States, 1980

by E. Earl Bryant and Ronald Biggar
National Center for Health Statistics

Executive Summary

The National Medical Care Utilization and Expenditure Survey was conducted throughout 1980 to collect information on health, access to and use of medical services, associated charges and sources of payment, and health insurance coverage. The survey was based on a probability sample of about 6,600 households and 17,123 people representative of the civilian noninstitutionalized population of the United States.

This report is one of a series of descriptive reports based on data from the National Medical Care Utilization and Expenditure Survey. It characterizes the population by hospital utilization and certain sociodemographic and health variables, and shows how hospitalization affects the use and cost of ambulatory medical care. The following are some of the highlights of the report.

- Almost everyone was covered by some form of health insurance at some time during 1980. Only 7.6 percent were not covered at all, and 10 percent had insurance only part of the year. The proportion not covered at all varied according to the number of times hospitalized, ranging from 8.2 percent for people not hospitalized during the year to 1.8 percent for people hospitalized three or more times.
- People with one or more hospital stays during 1980 had a physician visit rate greater than three times that for people not hospitalized. Similarly, the expenditures for ambulatory medical care for people experiencing hospitalizations was almost nine times that for people who were not hospitalized during the year.
- The rate of physician visits is much larger immediately prior to hospital admission or immediately after discharge than it is at other times. About 40 percent of all physician visits during the year occurred within a month before admission and after discharge.

NOTE: Significant contributions to this report were made by Robert J. Casady, Ph.D., who wrote Appendix I, "Technical Notes on Methods," and Mary Grace Kovar, Dr.P.H., who reviewed the draft of the report.

Introduction

The National Medical Care Utilization and Expenditure Survey provides comprehensive information on the noninstitutionalized population of the United States during 1980. This report presents statistics on how people utilized hospitals during 1980 and how hospitalizations affect the use of and expenditures for ambulatory medical care. In addition, the report investigates relationships between hospital use and living arrangements, health insurance coverage, and age.

The National Medical Care Utilization and Expenditure Survey (NMCUES) had three components:

- A national household survey based on a probability sample of the noninstitutionalized population of the United States.
- A four-state Medicaid household survey based on a random sample of Medicaid recipients.
- A Medicare and Medicaid administrative records survey.

The data for this report are based upon the National Household Survey (NHHS). Description of the other two components are presented elsewhere (Bonham, 1983).

The target population for the NHHS consisted of all persons who were members of the U.S. civilian noninstitutionalized population at any time between January 1, 1980, and December 31, 1980. All persons living in a sample dwelling unit at the time of the first interview contact became part of the national sample. Unmarried students 17–22 years of age who lived away from home were included in the sample when a parent or guardian was included in the sample. In addition, persons who died or were institutionalized between January 1 and the date of first interview were included in the sample if they were related to persons living in the sample dwelling units. All of these persons were considered "key" persons, and data were collected from them for the full 12 months of 1980 or for the proportion of time they were part of the U.S. civilian noninstitutionalized population. In addition, babies born to key persons were considered key persons, and data were collected for them from the time of birth. Relatives from outside the original population (that is, institutionalized, in the Armed Forces, or outside the United States between January 1 and the first interview) who moved in with key persons after the first interview also were considered key persons, and data were collected for them from the time they joined the key person. Relatives who moved in with key persons after the first interview but who were part of the civilian noninstitutionalized population on January 1, 1980, were classified as "nonkey" persons. Data were collected for nonkey persons for the time they lived with a key person, but because they had a chance for selection in the initial sample, their data are not used for general person-level analysis. However, nonkey person data are used in family analysis because they do contribute to the family's utilization of and expenditures for health care during the time they are part of the family.

Persons in the sample dwelling units were interviewed at approximately 3-month intervals beginning in February 1980 and ending in March 1981. The Core Questionnaire was administered during each of five rounds of interviewing. Approximately 80 percent of the third and fourth rounds of interviews were conducted by telephone; all remaining interviews were conducted in person. The respondent for the interview was required to be a household member 17 years of age or older. A proxy respondent not residing in the household was permitted only if eligible household members were unable to respond because of health, language, or mental condition.

This report largely focuses on people receiving ambulatory medical care and the corresponding expenditures for that care. Ambulatory medical care is defined as medical care provided by a medical doctor (M.D.), doctor of osteopathy (D.O.), or a person supervised by an M.D. or D.O. (for example, nurse practitioner or physician assistant) and which occurred at any place except in a hospital as an inpatient. Telephone calls are excluded from the volume and expenditures for care.

In general, the response rates for the survey were high. About 90 percent of the sample agreed to participate in the survey, and approximately 94 percent of the individuals in the participating reporting units supplied complete annual information. Caution should be exercised, however, in interpreting data on some items in this report because of high levels of imputation, namely hospital expenditures (36.3 percent), restricted activity days (18.0 percent), work-loss days (8.9 percent), and bed days (7.9 percent).

For a detailed discussion of the sample design, imputation procedures, estimation methods, and methods for testing hypotheses, see Appendix I. Definitions of terms used in the report are given in Appendix II. Also, the procedures and questionnaires used in the survey have been published elsewhere (Bonham, 1983). In this report, unless otherwise indicated in the text, differences between percents and totals are noted only if they are statistically significant at the 0.05 level. All statistically significant differences may not have been discussed, however. Some small arithmetic differences may be statistically significant but not of practical significance.

Findings

About 25,700,000 people, or 11.5 percent of the civilian noninstitutionalized population of the United States, were patients in short-stay hospitals during 1980. The proportion ranged from 5.9 percent for people under 17 years of age to 21.9 percent for those age 65 years and over (Table 1).

Of the people hospitalized, 22.5 percent were in a hospital more than once during 1980 (Table 2). Age is a primary factor for multiple admissions: About 37 percent of people 65 years and over had multiple admissions compared with only 9.7 percent of those under 17 years of age.

Insurance Coverage

Relatively few people were not covered by health insurance of some kind (Table 3). Only 7.6 percent of the population were without insurance during the entire year, 10.2 percent were covered only part of the year, and 82.2 percent had insurance the entire year.

The relationship between type of insurance coverage and number of times hospitalized is shown in Table 3 and Figure 1. The percent of people with no insurance or with only private insurance becomes smaller as the number of hospitalizations during the year increases. On the other hand, the percent of people with public insurance becomes larger as the number of hospitalizations increases.

These patterns also are present when insurance status is cross-classified by age (Table 4). The percent of people without any insurance coverage becomes smaller as the number of times hospitalized increases for each age group, except for people 65 years of age and over. In that age group almost everyone was covered by some form of public insurance. Contrastingly, the percent of people with public insurance coverage increased with number of times hospitalized within each age group except for the group 65 years and over.

These findings suggest that many people without insurance become eligible for public insurance coverage as their out-of-pocket costs become large. Also, people with only private insurance coverage become eligible for public insurance or assistance as their resources are depleted.

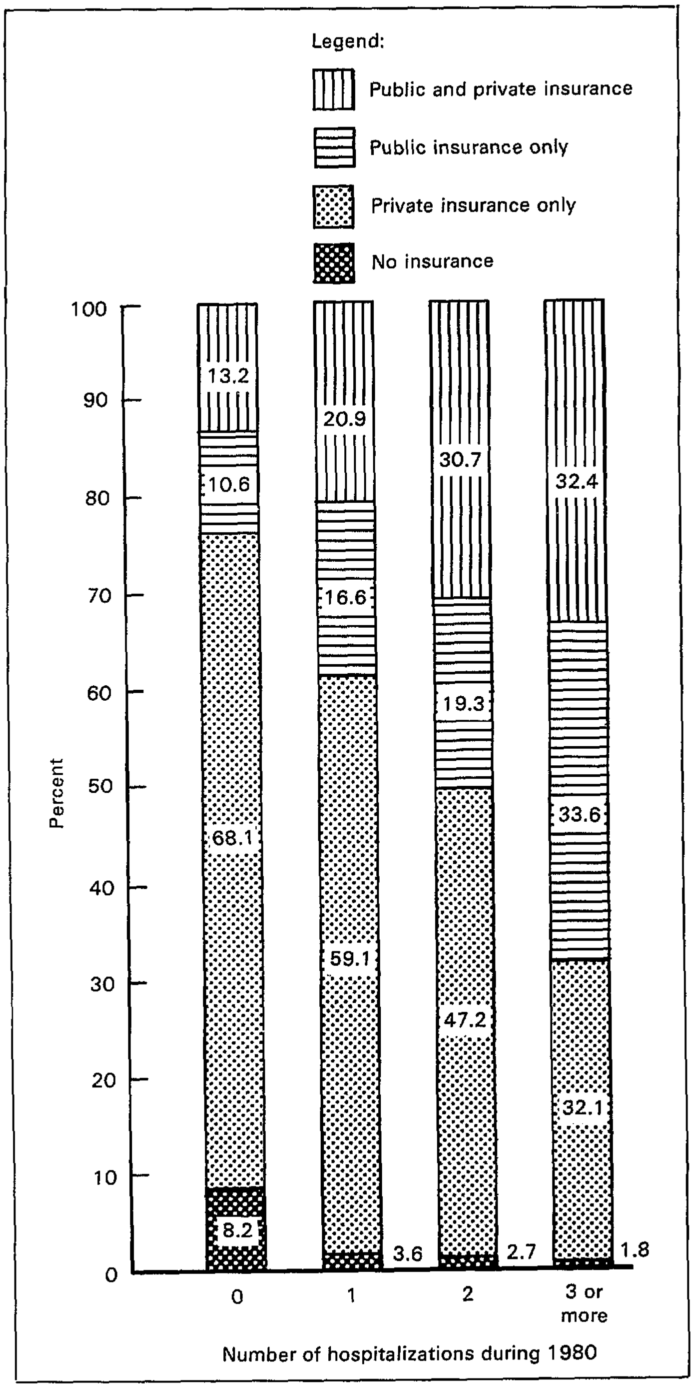


Figure 1.

Percent of population by type of health insurance coverage

Living Arrangement

About 12 percent of the population lived alone, with the vast majority living as nuclear families—that is, mother, father, child relationships (Table 5). The percent of people living alone increases as the number of times hospitalized increases. For people with multiple hospital episodes, the percent is double that for the Nation as a whole. One must be careful in interpreting this finding, however, because many older people, who as a group have a high rate of hospitalization, live alone. People 65 years of age and over, while accounting for only 10.5 percent of the civilian noninstitutionalized population, account for 40.9 percent of those hospitalized three or more times (Table 6).

The relationship between age and living arrangements is better delineated in Table 7. There is some evidence, although relatively weak, that the percent of people living alone increases with the number of times hospitalized, except for the age group under 17, where almost no one lived alone. Perhaps the most important statistic shown in Table 7, however, is that a third of people 65 years of age and over live alone, which suggests that a large number of older people do not have anyone at home to care for them after they are discharged from the hospital.

Volume of Physician Visits

The volume of physician visits is much greater for people hospitalized during the year than for people not hospitalized. People who were not hospitalized had 3.3 visits per year on the average; those hospitalized one or more times had 10.6 visits (Table 8). As expected, the number of visits increased with age, whether or not a person was hospitalized during the year. The number of visits per person 65 years of age and over was about 1.6 times the number for those under 17 for both zero and one or more hospitalizations.

Table 9 shows the number of physician visits per person per year by the number of months before admission to or after discharge from a hospital. For people with a single hospital episode during the survey year, that episode was the benchmark for determining the distribution of physician visits over time. For people with multiple hospitalizations, however, it was necessary to adopt a rule for linking visits to hospitalizations. The rule adopted was that a visit should be linked to the hospital episode nearest to it in time. A more detailed description of how Table 9 was constructed is given in Appendix I.

The probability of a physician visit is related to the time interval between the date of the visit and the date of hospitalization (Table 9). The number of visits per person becomes larger as the date of hospitalization approaches. A maximum is reached for the 30-day period immediately following discharge from the hospital; then the visit rate decreases with passage of time after discharge. Thus, for people hospitalized, visits to physicians are heavily concentrated within a 1- or 2-month period immediately before and after hospitalization. For people hospitalized only once, about 30 percent of the visits occurred within a month before or after the hospitalization, and 46 percent occurred within 2 months before or after the hospital episode.

There is evidence in Table 9 that the utilization of physician services for people hospitalized returns to the level for the general population by about 6 months following discharge. The estimated visit rate of 3.5 per person per year during the 30-day period occurring 6 months after discharge is about the same as for people not hospitalized, as shown in Table 8.

The overall ambulatory utilization patterns for people hospitalized only once and for people with multiple hospitalizations are similar, but the number of visits occurring within 2 months of the hospitalization is much higher for people with multiple hospitalizations than for people with only one hospitalization. This might be expected because, in general, people with multiple hospitalizations should have more serious or more persistent illnesses than those with a single hospital episode.

Activity Limitation

People hospitalized had several times more restricted activity days, bed days, and work-loss days than people not hospitalized during the year (Table 10). This is true for each age group, each living arrangement, and each sex. Restricted activity days and bed days are higher at older ages whether or not the person was hospitalized. The pattern is not so definite for work-loss days, however. For people not hospitalized, work-loss days are of similar magnitude for each age group, living arrangement, and sex. There is one notable exception. The number of work-loss days for people 65 years of age and over is significantly less than it is for those under 65. One possible explanation is that there is a selecting-out process so that older people who are eligible to retire keep on working if they are healthy.

Table 10 also shows that people in nuclear families have fewer restricted activity days and bed days than people living alone or with some other relatives. A partial explanation for these differences may relate to age. Many people living alone or other relatives living with nuclear families are of advanced age.

One note of caution should be made in interpreting the estimates in Table 10. Work-loss days refer to employed people 17 years of age and over while the other two measures refer to people of all ages. Thus, work-loss day estimates are not directly comparable to restricted activity day or bed-day estimates shown in Table 10. Also, work-loss days in Table 10 are not comparable to work-loss day estimates derived from the National Health Interview Survey (NHIS). NHIS is a continuous survey, and each week a different sample of people is asked whether they currently are employed. A work force of currently employed people is smaller than one based on people employed one or more weeks during the year. For this reason, work-loss days per employed person based on NMCUES is smaller than similar estimates based on NHIS (Wilder, 1983).

Expenditures for Prescribed Medicines

Expenditures for prescribed medicines for people hospitalized during the year were almost twice that for people not hospitalized ($99 versus $50) (Table 11). Expenditures increased with age, whether hospitalized, and were significantly higher in each age group for people hospitalized than for people not hospitalized. Expenditures are also more for people living alone than for people with other living arrangements. However, the difference is more a function of age than of living alone per se. Also, average expenditures for prescribed medicines were more for females than males. For people not hospitalized, the difference in average expenditures for males and females was statistically significant; for people hospitalized, expenditures were not significantly different.

Expenditures for Medical Care and Hospital Care

Table 12 shows expenditures for medical care for selected characteristics of the population by whether people were hospitalized during the year. Hospitalization has a large effect on the amount spent on medical care; expenditures for ambulatory care for people hospitalized during the year were $1,000 per person per year. For people not hospitalized during the year, average expenditures were only $112, or about 1/9 as much. For people hospitalized, total expenditures for care per person per year, including the cost while in the hospital, were $3,790.

Expenditures for medical care were higher with increasing age, which is true whether people were hospitalized or not.

For people without insurance and not hospitalized, expenditures for ambulatory medical care were much less than for people covered by health insurance. A similar pattern is observed for people hospitalized, but only difference between "no insurance" and "public and private insurance" is statistically significant.

Expenditures for hospital care were lowest for people with private insurance only ($2,209 per person hospitalized during 1980) followed by expenditures for people without any insurance ($2,769). This compares with expenditures of $3,324 and $3,744 for people with public insurance only or a combination of public and private insurance, respectively. A possible explanation of these differences was given earlier in this report: People without insurance become eligible for public insurance coverage as their out-of-pocket costs become large and as their resources are depleted.

People who live alone had significantly higher expenditures for ambulatory care than those with other living arrangements, whether or not hospitalized. They also had higher hospital expenditures than people with nuclear family living arrangements, $3,279 and $2,571 per person per year, respectively. A major reason for this difference is that the average length of stay in the hospital for people living alone was longer than for others, as shown in Table 13. Overall, the average length of stay for people living alone was 9.9 days compared with 7.0 days for people in nuclear families, where the vast majority are classified.

Expenditures for hospital care for people living with other relatives also were very high. These large expenditures primarily were caused by very long stays in the hospital, especially stays associated with multiple hospital admissions (Table 13).

It also is worth noting in Table 12 that, for people not hospitalized, females had higher expenditures for ambulatory care than males ($125 versus $98). Expenditures for ambulatory care for people hospitalized is about the same for males and females. For hospital care the relationship is reversed; expenditures for care in the hospital per person per year were much larger for males than for females ($3,168 versus $2,529).

References

Bonham, G. S.: Procedures and questionnaires of the National Medical Care Utilization and Expenditures Survey. Series A, Methodological Report No. 1. DHHS Pub. No. 83–20001. National Center for Health Statistics, Public Health Service. Washington. U.S. Government Printing Office, Mar. 1983.

SAS Institute, Inc.: *SAS Users Guide, Basics, 1982 edition.* Cary, N.C. 1982.

Shah, B. V.: SESUDAAN, Standard Errors Program for Computing of Standard Rates for Sample Survey Data. Research Triangle Park, N.C. Research Triangle Institute, Apr. 1981.

Wilder, C. S.: Disability Days, United States, 1980. *Vital and Health Statistics.* Series 10, No. 143. DHHS Pub. No. (PHS) 83–1571. National Center for Health Statistics, Public Health Service. Washington. U.S. Government Printing Office, July 1983.

List of Detailed Tables

1. Number and percent distribution of population by number of times hospitalized, according to age: United States, 1980 9
2. Number and percent distribution of population hospitalized by number of times hospitalized, according to age: United States, 1980. 9
3. Number and percent distribution of population by type of health insurance coverage, according to number of times hospitalized: United States, 1980. 9
4. Number and percent distribution of population by age and type of health insurance coverage, according to number of times hospitalized: United States, 1980 10
5. Number and percent distribution of population by living arrangement, according to number of times hospitalized: United States, 1980. 11
6. Number and percent distribution of population by age, according to number of times hospitalized: United States, 1980 11
7. Number and percent distribution of population by age and living arrangements, according to number of times hospitalized: United States, 1980. 12
8. Number of physician visits per person per year and associated standard errors by age and living arrangement, and number of times hospitalized: United States, 1980 13
9. Number of physician visits per person, and associated standard errors, annualized for persons hospitalized during 1980, by number of times hospitalized: United States, 1980 13
10. Restricted activity days, bed days, and work-loss days per person per year and associated standard errors by age, living arrangements, sex, and number of times hospitalized: United States, 1980. 14
11. Expenditures for prescribed medicines per person per year and associated standard errors by age, living arrangement, and sex, and number of times hospitalized during the year: United States, 1980 14
12. Expenditures for medical care and associated standard errors by whether or not hospitalized during the year, including and excluding hospital expenditures: United States, 1980 15
13. Average length of stay in short-stay hospitals and associated standard errors by living arrangement and age, and number of times hospitalized: United States, 1980 15

Table 1

Number and percent distribution of population by number of times hospitalized, according to age: United States, 1980

Age	Population	Sample	Number of times hospitalized		
			Total	0	1 or more
	Number in millions	Number	Percent distribution		
All ages	222.9	17,123	100.0	88.5	11.5
Under 17 years	61.6	5,047	100.0	94.1	5.9
17–44 years	94.2	6,828	100.0	88.0	12.0
45–64 years	43.6	3,376	100.0	87.2	12.8
65 years and over	23.5	1,872	100.0	78.1	21.9

Table 2

Number and percent distribution of population hospitalized by number of times hospitalized, according to age: United States, 1980

Age	Population hospitalized	Sample persons hospitalized	Number of times hospitalized			
			Total	1	2	3 or more
	Number in millions	Number	Percent distribution			
All ages	25.7	2,004	100.0	77.5	16.1	6.4
Under 17 years	3.7	305	100.0	90.2	7.1	2.6
17–44 years	11.3	823	100.0	80.9	15.6	3.5
45–64 years	5.6	441	100.0	75.6	15.7	8.7
65 years and over	5.1	435	100.0	63.0	23.9	13.1

Table 3

Number and percent distribution of population by type of health insurance coverage, according to number of times hospitalized: United States, 1980

Type of health insurance	Number of times hospitalized				
	Total	0	1	2	3 or more
	Number				
Population in millions	222.9	197.2	19.9	4.1	1.6
Sample	17,123	15,119	1,544	324	136
	Percent distribution				
All types	100.0	100.0	100.0	100.0	100.0
No insurance	7.6	8.2	3.6	*2.7	*1.8
Covered for full year					
Private insurance only	58.2	59.4	52.7	41.1	30.5
Medicare and private insurance	8.1	7.1	12.9	25.6	26.9
Other public and private insurance	6.2	6.1	8.0	*5.1	*5.5
Medicare only	1.9	1.8	2.6	*2.9	*4.0
Other public only	3.7	3.2	6.4	7.7	23.0
Medicaid only	4.1	3.9	5.7	*4.6	*6.3
Covered for part of year					
Private insurance only	8.4	8.7	6.4	6.1	*1.6
Public insurance only	1.8	1.7	1.9	*4.1	*0.3

*Relative standard errors of these estimates are 30 percent or more.

Table 4

Number and percent distribution of population by age and type of health insurance coverage, according to number of times hospitalized: United States, 1980

Age and type of health insurance	Number of times hospitalized			
	Total	0	1	2 or more
Under 17 years	Number			
Population in millions	61.6	58.0	3.3	0.4
Sample	5,047	4,742	275	30
	Percent distribution			
All types of insurance	100.0	100.0	100.0	100.0
No insurance	7.8	8.2	*2.1	*-
Public insurance only	15.3	14.6	26.1	*25.9
Private insurance only	68.2	68.9	57.0	59.8
Public and private	8.8	8.4	14.8	*14.3
17–44 years	Number			
Population in millions	94.2	82.9	9.1	2.2
Sample	6,828	6,005	670	153
	Percent distribution			
All types of insurance	100.0	100.0	100.0	100.0
No insurance	9.5	10.2	4.7	*4.3
Public insurance only	7.8	6.8	13.0	20.7
Private insurance only	76.4	77.0	73.3	68.2
Public and private	6.3	6.0	9.1	*6.9
45–64 years	Number			
Population in millions	43.6	38.0	4.2	1.4
Sample	3,376	2,935	327	114
	Percent distribution			
All types of insurance	100.0	100.0	100.0	100.0
No insurance	6.5	6.9	*4.1	*2.1
Public insurance only	9.1	8.1	11.5	28.3
Private insurance only	73.2	74.4	69.7	50.6
Public and private	11.3	10.6	14.7	19.1
65 years and over	Number			
Population in millions	23.5	18.3	3.2	1.9
Sample	1,872	1,437	272	163
	Percent distribution			
All types of insurance	100.0	100.0	100.0	100.0
No insurance	1.7	*1.8	*1.2	*1.1
Public insurance only	27.7	28.2	25.8	25.5
Private insurance only	4.1	*4.2	*4.6	*2.9
Public and private	66.5	65.8	68.5	70.5

*Relative standard errors of these estimates are 30 percent or more.

Table 5

Number and percent distribution of population by living arrangement, according to number of times hospitalized: United States, 1980

Living arrangement	Number of times hospitalized				
	Total	0	1	2	3 or more
			Number		
Population in millions	222.9	197.2	19.9	4.1	1.6
Sample	17,123	15,119	1,544	324	136
			Percent distribution		
All types	100.0	100.0	100.0	100.0	100.0
Alone	11.8	11.4	12.6	23.6	25.9
Nuclear family	83.9	84.5	82.4	71.9	64.8
Other relative	3.9	3.7	4.6	4.5	*8.8
Unknown	0.4	0.4	0.3	*0.0	*0.5

*Relative standard errors of these estimates are 30 percent or more.

Table 6

Number and percent distribution of population by age, according to number of times hospitalized: United States, 1980

Age	Number of times hospitalized				
	Total	0	1	2	3 or more
			Number		
Population in millions	222.9	197.2	19.9	4.1	1.6
Sample	17,123	15,119	1,544	324	136
			Percent distribution		
All ages	100.0	100.0	100.0	100.0	100.0
Under 17 years	27.7	29.4	16.6	6.3	*5.9
17–44 years	42.3	42.0	45.9	42.7	23.8
45–64 years	19.6	19.3	21.2	21.2	29.5
65 years and over	10.5	9.3	16.3	29.8	40.9

*Relative standard errors of these estimates are 30 percent or more.

Table 7

Number and percent distribution of population by age and living arrangements, according to number of times hospitalized: United States, 1980

Age and living arrangement	Total	0	1	2 or more
	Number of times hospitalized			
Under 17 years	Number			
Population in millions	61.6	58.0	3.3	0.4
Sample	5,047	4,742	275	30
	Percent distribution			
All arrangements	100.0	100.0	100.0	100.0
Alone	0.1	*0.1	*-	*-
Nuclear family	93.3	93.5	90.2	87.3
Other relative	6.0	5.8	9.4	*10.4
Unknown	0.6	0.6	*0.4	2.3
17–44 years	Number			
Population in millions	94.2	82.9	9.1	2.2
Sample	6,828	6,005	670	153
	Percent distribution			
All arrangements	100.0	100.0	100.0	100.0
Alone	13.9	14.0	12.4	18.7
Nuclear family	83.8	83.6	85.9	79.7
Other relative	2.1	2.1	1.5	*2.2
Unknown	0.2	0.2	*0.3	-
45–64 years	Number			
Population in millions	43.6	38.0	4.2	1.4
Sample	3,376	2,935	327	11.4
	Percent distribution			
All arrangements	100.0	100.0	100.0	100.0
Alone	12.4	12.3	11.2	17.7
Nuclear family	85.2	85.3	85.7	80.4
Other relative	2.1	2.0	*2.4	*1.9
Unknown	*0.4	*0.3	*0.7	*-
65 years and over	Number			
Population in millions	23.5	18.3	3.2	1.9
Sample	1,872	1,437	272	163
	Percent distribution			
All arrangements	100.0	100.0	100.0	100.0
Alone	33.0	33.1	28.3	40.6
Nuclear family	57.7	58.3	60.2	48.0
Other relative	9.0	8.3	11.5	*11.4
Unknown	*0.3	*0.4	*-	*-

*Relative standard errors of these estimates are 30 percent or more.

Table 8

Number of physician visits per person per year and associated standard errors by age and living arrangement, and number of times hospitalized: United States, 1980

Age and living arrangement	Number of times hospitalized							
	Total		0			1 or more		
	Visits per person per year	Standard error	Visits per person per year	Standard error	Number in sample	Visits per person per year	Standard error	Number in sample
All ages	4.1	0.08	3.3	0.07	15,119	10.6	0.31	2,004
Under 17 years	3.3	0.10	3.0	0.10	4,742	7.8	0.44	305
Alone	3.6	0.76	3.6	0.76	4	*-	*-	*-
Nuclear family	3.3	0.11	3.0	0.10	4,446	8.0	0.48	275
Other relative	2.9	0.30	2.6	0.29	261	5.5	0.74	27
17–44 years	3.7	0.10	2.8	0.09	6,005	10.0	0.40	823
Alone	4.3	0.35	3.5	0.36	588	10.3	1.2	76
Nuclear family	3.7	0.10	2.8	0.08	5,264	10.1	0.43	729
Other relative	2.2	0.40	1.8	0.39	138	5.9	1.52	16
45–64 years	4.8	0.16	3.8	0.13	2,935	11.6	0.68	441
Alone	5.8	0.51	5.0	0.50	312	11.4	1.97	47
Nuclear family	4.7	0.17	3.6	0.12	2,548	11.8	0.79	379
Other relative	3.5	0.56	2.9	0.64	65	6.9	1.14	13
65 years and over	6.7	0.30	5.0	0.23	1,437	12.7	0.71	435
Alone	6.6	0.38	5.1	0.26	462	12.3	0.94	137
Nuclear family	6.6	0.36	5.0	0.35	851	12.6	0.87	242
Other relative	7.2	1.07	4.6	0.74	119	13.9	2.49	56

Table 9

Number of physician visits per person, and associated standard errors, annualized for persons hospitalized during 1980, by number of times hospitalized: United States, 1980

Number of times hospitalized	Total for the year	Number of months before hospitalization						Number of months after hospitalization					
		6	5	4	3	2	1	1	2	3	4	5	6
	Visits per person per year												
Total	6.3	3.1	4.3	5.4	7.4	9.8	22.6	25.8	12.3	8.4	5.6	4.7	3.7
1	4.6	3.2	4.6	5.0	6.2	7.5	18.1	16.8	8.6	6.5	4.8	4.2	3.5
2 or more	12.0	2.6	3.4	6.5	11.5	17.7	38.2	56.7	52.2	14.8	8.5	6.1	4.4
	Standard error												
Total	0.22	0.21	0.31	0.32	0.45	0.55	0.68	1.31	0.67	0.52	0.35	0.40	0.45
1	0.13	0.25	0.40	0.37	0.42	0.49	0.51	0.69	0.45	0.44	0.29	0.36	0.30
2 or more	0.71	0.34	0.57	0.72	1.18	1.74	2.29	4.71	2.02	1.40	0.94	1.11	1.58

NOTE: Excludes hospitalizations for deliveries and associated physician visits. Physician visits to hospital inpatients also are excluded. All data annualized for persons hospitalized during 1980.

Table 10

Restricted activity days, bed days, and work-loss days per person per year and associated standard errors by age, living arrangements, sex, and number of times hospitalized: United States, 1980

Age, living arrangement, and sex	Restricted activity days per person per year (RADS)				Bed days per person per year (BDS)				Work-loss days per employed person 17 years of age and over (WLDS)			
	0 hospitalizations		1 or more hospitalizations		0 hospitalizations		1 or more hospitalizations		0 hospitalizations		1 or more hospitalizations	
Age	RADS	SE	RADS	SE	BDS	SE	BDS	SE	WLDS	SE	WLDS	SE
All ages	15.0	0.5	49.4	1.7	6.9	0.2	22.3	0.9	2.9	0.1	21.4	1.1
Under 17 years	9.5	0.3	21.4	1.4	5.9	0.2	11.8	0.9	-	-	-	-
17–44 years	12.0	0.6	38.4	1.8	5.6	0.2	16.3	0.7	2.8	0.2	19.2	1.2
45–64 years	22.2	1.1	66.0	3.6	8.6	0.6	28.5	2.3	3.3	0.3	28.2	2.3
65 years and over	38.3	3.1	75.7	4.7	18.3	2.5	36.0	2.7	1.8	0.4	17.8	3.5
Living arrangement												
Alone	22.8	1.3	62.3	4.8	8.6	0.7	27.3	2.5	3.4	0.3	21.6	2.9
Nuclear family	13.8	0.5	46.0	1.9	6.6	0.2	20.3	0.9	2.9	0.2	21.4	1.2
Other relative	16.0	1.8	64.5	7.2	8.5	0.8	39.8	5.8	3.2	1.2	17.0	5.6
Sex												
Male	14.1	0.6	50.6	2.4	6.0	0.2	21.6	1.2	2.9	0.2	26.4	1.9
Female	15.7	0.6	48.6	2.3	7.6	0.3	22.7	1.2	3.0	0.2	17.5	1.4

NOTE: SE = standard error.

Table 11

Expenditures for prescribed medicines per person per year and associated standard errors by age, living arrangement, and sex, and number of times hospitalized during the year: United States, 1980

Age, living arrangement, and sex	Number of times hospitalized					
	Total		0		1 or more	
Age	Expenditures	Standard error	Expenditures	Standard error	Expenditures	Standard error
All ages	$58.18	1.41	$50.06	1.25	$98.99	4.69
Under 17 years	22.08	0.73	20.97	0.73	33.66	2.38
17–44 years	38.36	1.23	34.29	1.04	57.43	4.61
45–64 years	95.26	3.34	83.56	3.84	150.71	8.49
65 years and over	123.10	4.12	107.63	3.93	166.52	9.55
Living arrangement						
Alone	82.04	3.65	72.30	3.33	122.19	10.29
Nuclear family	53.73	1.30	46.26	1.15	93.12	4.99
Other relative	70.17	5.89	56.19	5.89	122.44	13.57
Sex						
Male	52.52	1.46	44.47	1.52	96.91	6.02
Female	62.39	1.82	54.33	1.52	100.35	5.97

Table 12

Expenditures for medical care and associated standard errors by whether or not hospitalized during the year, including and excluding hospital expenditures: United States, 1980

Characteristic	Expenditures for medical care per person not hospitalized		Expenditures for medical care per person hospitalized					
			Total		Not in hospital		In hospital	
	Expenditures	Standard error	Expenditures	Standard error	Expenditures	Standard error	Expenditures	Standard error
Total	$112	3	$3,790	123	$1,000	34	$2,790	104
Marital status								
Single	94	3	2,726	193	677	46	2,049	168
Married	121	4	3,962	160	1,098	41	2,864	145
Widowed	157	10	6,080	557	1,477	140	4,603	470
Divorced	141	11	3,362	219	838	70	2,524	185
Age								
Under 17 years	90	4	2,042	151	525	37	1,517	140
17–44 years	104	3	2,953	137	867	33	2,086	120
45–64 years	139	6	4,538	264	1,193	78	3,345	231
65 years and over	165	10	6,058	394	1,420	94	4,638	336
Type of health insurance								
No insurance	56	4	3,443	946	674	160	2,769	803
Public only	141	9	4,108	305	785	51	3,324	274
Private only	103	3	3,168	141	960	40	2,209	117
Public and private	168	8	5,058	306	1,314	90	3,744	255
Living arrangement								
Alone	151	7	4,413	319	1,134	89	3,279	265
Nuclear family	108	3	3,553	120	982	33	2,571	106
Other relative	88	9	5,726	938	874	136	4,852	848
Sex								
Male	98	4	4,169	216	1,001	54	3,168	182
Female	125	4	3,528	159	999	38	2,529	144

Table 13

Average length of stay in short-stay hospitals and associated standard errors by living arrangement and age, and number of times hospitalized: United States, 1980

Living arrangement and age	Total		Number of times hospitalized					
			1		2		3 or more	
	Days	SE	Days	SE	Days	SE	Days[1]	SE
All types	7.6	0.4	7.2	0.5	8.7	0.5	9.0	0.6
Living arrangement								
Alone	9.9	1.8	9.9	2.8	10.1	0.9	9.7	1.1
Nuclear family	7.0	0.3	6.8	0.4	7.9	0.5	8.0	0.6
Other relative	9.1	1.0	7.3	0.8	13.1	3.7	15.6	2.3
Age								
Under 17 years	4.9	0.8	5.0	0.9	3.7	0.5	4.9	1.3
17–44 years	6.6	0.7	6.5	0.9	6.9	0.6	6.2	1.1
45–64 years	8.7	0.5	8.4	0.6	10.2	1.0	8.6	0.9
65 years and over	10.0	0.5	9.3	0.7	11.0	1.0	11.6	0.9

[1]For this residual class, the estimates shown are the number of days per person per year.

NOTE: SE = standard error.

Appendixes

I. Technical Notes on Methods 17
  Survey Background 17
  Sample Design of NMCUES 17
  Research Triangle Institute Sample Design 18
  National Opinion Research Center Sample Design 18
  Collection of Data 19
  Imputation 19
  Weighting and Estimation 20
  Estimators 21
  Reliability of Estimates 21
  Physician Visits Associated With Hospitalization in Table 9 23
II. Definition of Terms 24

Appendix Table

I. Design effects for standard errors of estimated percents shown in Tables 1–7 23

Appendix I. Technical Notes on Methods

Survey Background

The National Medical Care Utilization and Expenditure Survey was a panel survey designed to collect data about the U.S. civilian noninstitutionalized population in 1980. During the course of the survey, information was obtained on health, access to and use of medical services, associated charges and sources of payment, and health insurance coverage. The survey was cosponsored by the National Center for Health Statistics and the Health Care Financing Administration. Data collection was provided under contract by the Research Triangle Institute and its subcontractors, National Opinion Research Center and SysteMetrics, Inc.

The basic survey plan for NMCUES drew heavily on two surveys, the National Health Interview Survey (NHIS), conducted by the National Center for Health Statistics, and the National Medical Care Expenditure Survey (NMCES), cosponsored by the National Center for Health Services Research and the National Center for Health Statistics.

NHIS is a continuing, multipurpose, cross-sectional survey first conducted in 1957. The main purpose of NHIS is to collect information on illness, disability, and the use of medical care. Although some information on medical expenditures and insurance payments has been collected in NHIS, the cross-sectional nature of the survey design is not well suited for providing annual data on expenditures and payments.

NMCES was a panel survey in which a sample of households was interviewed six times over an 18-month period in 1977 and 1978. NMCES was specifically designed to provide comprehensive data on how health services were used and paid for in the United States in 1977.

NMCUES is similar to NMCES in survey design and questionnaire wording, so that analysis of some of the changes during the 3 years between 1977 and 1980 is possible. Both NMCUES and NMCES used question wording that was similar to NHIS in areas common to the three surveys. Together they provide extensive information on illness, disability, use of medical care, costs of medical care, sources of payment for medical care, and health insurance coverage at two points in time.

Sample Design of NMCUES

The NMCUES sample of housing units and group quarters, hereafter jointly referred to as dwelling units, is a concatenation of two independently selected national samples, one provided by the Research Triangle Institute and the other by the National Opinion Research Center. The sample designs used by these two organizations are similar with respect to principal design features; both can be characterized as stratified, four-stage area probability designs. The principal differences between the two designs are the type of stratification variables and the specific definitions of sampling units at each stage. The salient design features of the two sample surveys are summarized in the following sections.

The target population for NMCUES consisted of all persons who were members of the U.S. civilian noninstitutionalized population at any time between January 1, 1980, and December 31, 1980. All persons living in a sample dwelling unit at the time of the first interview contact became part of the national sample. Unmarried students 17–22 years of age who lived away from home were included in the sample when a parent or guardian was included in the sample. In addition, persons who died or were institutionalized between January 1 and the date of first interview were included in the sample if they were related to persons living in the sampled dwelling units. All of these persons were considered "key" persons, and data were collected for them for the full 12 months of 1980 or for the proportion of time they were part of the U.S. civilian noninstitutionalized population. In addition, babies born to key persons were considered key persons, and data were collected for them from the time of birth. Relatives from outside the original population (that is, institutionalized, in the Armed Forces, or outside the United States between January 1 and the first interview) who moved in with key persons after the first interview were also considered key persons, and data were collected for them from the time they joined the key person. Relatives who moved in with key persons after the first interview but were part of the civilian noninstitutionalized population on January 1, 1980, were classified as "nonkey" persons. Data were collected for nonkey persons for the time that they lived with a key person but, because they had a chance of selection in the initial sample, their data are not used for general person-level analysis. However, data for nonkey persons are used in family analysis because they do contribute to the family's utilization of and expenditures for health care during the time they are part of the family.

Persons included in the sample were grouped into "reporting units" for data collection purposes. Reporting units were defined as all persons related to each other by blood, marriage, adoption, or foster care status and living in the same dwelling unit. The combined NMCUES sample consisted of 7,244 eligible reporting units, of which 6,599 agreed to participate in the survey. In total, data were obtained on 17,123 key persons. The Research Triangle Institute sample yielded 8,326 key persons and the National Opinion Research Center sample 8,797.

Research Triangle Institute Sample Design

A primary sampling unit (PSU) is defined as a county, a group of contiguous counties, or parts of counties with a combined minimum 1970 population size of 20,000. A total of 1,686 disjoint PSU's exhaust the land area of the 50 States and Washington, D.C. The PSU's are classified as one of two types. The 16 largest standard metropolitan statistical areas (SMSA's) are designated as self-representing PSU's, and the remaining 1,670 PSU's in the primary sampling frame are designated as non-self-representing PSU's.

PSU's are grouped into strata whose members tend to be relatively alike within strata and relatively unlike between strata. PSU's derived from the 16 largest SMSA's had sufficient population in 1970 to be treated as primary strata. The 1,659 non-self-representing PSU's from the continental United States were stratified into 42 primary strata with approximately equal populations. Each of these primary strata had a 1970 population of about 3⅓ million. One supplementary primary stratum of 11 PSU's, with a 1970 population of about 1 million, was added to the Research Triangle Institute primary frame to include Alaska and Hawaii.

The total first stage sample for Research Triangle Institute consisted of 59 PSU's, of which 16 were self-representing PSU's. The non-self-representing PSU's were obtained by selecting one PSU from each of the 43 non-self-representing primary strata. These PSU's were selected with probability proportional to 1970 population size.

In each of the 59 sample PSU's the entire PSU was divided into smaller disjoint area units called secondary sampling units (SSU's). Each SSU consisted of one or more 1970 Census-defined enumeration districts or block groups. Within each PSU the SSU's were ordered and then partitioned to form secondary strata of approximately equal size. Two secondary strata were formed in the non-self-representing PSU drawn from Alaska and Hawaii, and four secondary strata were formed in each of the remaining 42 non-self-representing PSU's. Thus, the non-self-representing PSU's were partitioned into a total of 170 secondary strata. In a similar manner the 16 self-representing PSU's were partitioned into 144 secondary strata.

In the second stage of selection one SSU was selected from each of the 144 secondary strata covering the self-representing PSU's, and two SSU's were selected from each of the remaining secondary strata. All second-stage sampling was with replacement and with probability proportional to the SSU's total noninstitutionalized population. The total number of sample SSU's was $2 \times 170 + 144 = 484$.

For the third stage of selection each SSU was first divided into smaller disjoint geographic areas, and one area within the SSU was selected with probability proportional to the total number of housing units in 1970. Next, one or more disjoint segments of at least 60 housing units were formed in the selected area. One segment was selected from each SSU with probability proportional to the segment housing unit count. In response to the sponsoring agencies' request that the expected household-sample size be reduced, a systematic sample of one-sixth of the segments was deleted from the sample. Thus, the total third-stage sample was reduced to 404 segments.

For the fourth stage of selection all of the dwelling units within the segment were listed, and a systematic sample of dwelling units was selected. The procedures used to determine the sampling rate for segments guaranteed that all dwelling units had an approximately equal overall probability of selection. All of the reporting units within the selected dwelling units were included in the sample.

National Opinion Research Center Sample Design

The land area of the 50 States and Washington, D.C., was also divided into disjoint PSU's for the National Opinion Research Center sample design. A PSU consisted of SMSA's, parts of SMSA's, counties, parts of counties, or independent cities. Grouping of counties into a single PSU occurred when individual counties had a 1970 population of less than 10,000.

The PSU's were classified into two groups according to metropolitan status—SMSA or not SMSA. These two groups were individually ordered and then partitioned into zones with a 1970 census population size of approximately 1 million.

A single PSU was selected within each zone with a probability proportional to its 1970 population. It should be noted that this procedure allowed a PSU to be selected more than one time. For instance, an SMSA primary sampling unit with a population of 3 million could be selected at least twice and possibly as many as four times. The full general-purpose sample contained 204 PSU's. These 204 PSU's were systematically allocated for four subsamples of 51 PSU's. The final set of 76 sample PSU's was chosen by randomly selecting two complete subsamples of 51 PSU's; one subsample was included in its entirety, and 25 of the PSU's in the other subsample were selected systematically for inclusion in NMCUES.

For the second stage each of the PSU's selected in the first stage was partitioned into a disjoint set of SSU's defined by block groups, enumeration districts, or a combination of the two types of Census units. Within each sample PSU the SSU's were ordered and then partitioned into 18 zones such that each zone contained approximately the same number of households. One SSU had the opportunity to be selected more than once, as was the case in the PSU selection. If a PSU had been hit more than once in the first stage, the second-stage selection process was repeated as many times as there were first-stage hits. The 405 SSU's were identified by selecting 5 SSU's from each of the 51 PSU's in the subsample that was included in its entirety, and 6 SSU's from each of the 25 PSU's in the group for which only one-half of the PSU's were included.

The SSU's selected in the second stage were then subdivided into area segments with a minimum size of 100 housing units each. One segment was then selected with probability proportional to the estimated number of housing units.

The fourth stage sample selection of housing units for the National Opinion Research Center was essentially the same as that used by the Research Triangle Institute.

Collection of Data

Field operations for NMCUES were performed by the Research Triangle Institute and the National Opinion Research Center under specifications established by the sponsoring agencies. Persons in the sample dwelling units were interviewed at approximately 3-month intervals beginning in February 1980 and ending in March 1981. The Core Questionnaire was administered during each of the five rounds of interviews to collect data on health, health care, health care charges, sources of payment, and health insurance coverage. A summary of responses was used to update information reported in previous rounds. Supplements to the Core Questionnaire were used during the first, third, and fifth rounds of interviews to collect data that were not expected to change during the year or that were needed only once. Approximately 80 percent of the third and fourth rounds of interviews were conducted by telephone; all remaining interviews were conducted in person. The respondent for the interview was required to be a household member 17 years of age or older. A proxy respondent not residing in the household was permitted only if all eligible household members were unable to respond because of health, language, or mental condition.

Imputation

Nonresponse in panel surveys such as NMCUES occurs when sample individuals refuse to participate in the survey (total nonresponse), when initially participating individuals drop out of the survey (attrition nonresponse), or when data for specific items on the questionnaire are not collected (item nonresponse). In general, response rates for NMCUES were excellent: approximately 90 percent of the sample reporting units agreed to participate in the survey, and approximately 94 percent of the individuals in the participating reporting units supplied complete annual information. Even though the overall response rates are quite high for NMCUES, the estimates of means and proportions may be biased if nonrespondents have different health care experiences than respondents, or if there is a substantial response rate differential across subgroups of the target population. Furthermore, totals will tend to be underestimated unless allowance is made for the loss of data due to nonresponse.

Two methods commonly used to compensate for survey nonresponse are data imputation and the adjustment of sampling weights. For NMCUES, imputation was used to compensate for attrition and item nonresponse, and weight adjustment was used to compensate for total nonresponse. The calculation of the weight adjustment factors is discussed in the section on sampling weights.

A specialized form of the sequential hot-deck imputation method was used for attrition imputation. First, each sample person with incomplete annual data (hereafter referred to as a "recipient") was linked to a sample person with similar demographic and socioeconomic characteristics who had complete annual data (hereafter referred to as a "donor"). Second, the time periods for which the recipient had missing data were divided into two categories: imputed eligible days and imputed ineligible days. The imputed eligible days were those days for which the donor was eligible (that is, in scope) and the imputed ineligible days were those days for which the donor was ineligible (that is, out of scope). For the recipient's imputed eligible days, the donor's medical care experiences (such as medical provider visits, dental visits, or hospital stays) were imputed into the recipient's record. Finally, the results of the attrition imputation were used to make the final determination of a person's respondent status. If more than two-thirds of the person's total eligible days (both reported and imputed) were imputed, then the person was considered to be a total nonrespondent, and all data for the person were removed from the analytic data file.

The data collection methodology and field quality control procedures for NMCUES were designed so that the data would be as accurate and complete as possible subject to budget considerations. However, individuals cannot report data that are unknown to them, or they may choose not to report the data even if known. This latter situation is especially true for data relating to expenditures, income, and other sensitive topics. Because of the size and complexity of the NMCUES data base it was not feasible, from the standpoint of cost, to replace all missing data for all data items. The 12-month data files, for example, contain approximately 1,400 data items per person. With this in mind, the NMCUES approach was to designate a subset of the total items on the data base for imputation of the missing data. Thus, for 5 percent of the NMCUES data items the responses were edited and missing data imputed by a combination of logic and hot-deck procedures to produce revised variables for use in analysis. Items for which imputations were made cover the following data areas:

- Visit charges.
- Source of payment codes and amounts.
- Annual disability days.
- Health insurance premium amount.
- Length of hospital stay.
- Total weeks worked in 1980.
- Average hours worked per week.
- Educational level.
- Hispanic ethnicity.
- Income.
- Age and birthdate.
- Race.
- Sex.
- Health insurance coverage.
- Visit dates.

These items were selected as the most important variables for statistical analyses.

Weighting and Estimation

For the analysis of NMCUES data, sample weights are required to reflect the complex sample design and to adjust for the potential biasing effects of systematic nonsampling errors related to total nonresponse and sampling frame undercoverage. Data imputation procedures, discussed in the preceding section, were used to compensate for attrition and item nonresponse.

Development of weights reflecting the sample design of NMCUES was the first step in the computation of person-level analytical weights. The basic sample-design weight for a dwelling unit is the product of four weight components that correspond to the four stages of sample selection. Each of the four weight components is either the inverse of the probability of selection at the stage when sampling was without replacement, or it is the inverse of the expected number of selections when sampling was with replacement and multiple selection of the sample unit was possible.

As previously discussed, the NMCUES sample is composed of two independently selected samples. Each sample, together with its basic sampling weights, yields independent unbiased estimates of population parameters. Because the two NMCUES samples were of approximately equal size, a simple average of the two independent estimators was used for the combined sample estimator. This is equivalent to defining an adjusted basic weight by dividing each basic sample weight by 2. Hereafter only the combined sample and the adjusted basic weights are considered.

The total nonresponse-undercoverage adjustment factor is computed at the reporting unit (RU) level. Because every RU within a dwelling unit is included in the sample, the adjusted basic weight assigned to an RU is simply the adjusted basic weight for the dwelling unit in which the RU is located. As noted above, an RU was classified as responding if the RU initially agreed to participate in NMCUES and as nonresponding otherwise.

Initially 96 RU weight adjustment cells were formed by cross-classifying the following RU variables: race of RU head (white or all other), type of RU head (female, male, or husband-wife), age of RU head (four levels), and size of RU (four levels). These cells were then collapsed to 63 cells so that each cell contained at least 20 responding RU's.

The formula for computing the total nonresponse-undercoverage adjustment factor for RU's in cell C was

$$A_1(C) = \frac{\mathrm{CPS}(C)}{\sum_{k \in C} \phi(k) W_1(k)}$$

where $\mathrm{CPS}(C)$ = March 1980 Current Population Survey estimate of the number of RU's in cell C

$$\phi(k) = \begin{cases} 1 & \text{if } k\text{th RU was classified as responding} \\ 0 & \text{otherwise} \end{cases}$$

$W_1(k)$ = the adjusted basic weight for the kth RU

The nonresponse-undercoverage adjusted weight for the kth RU, denoted by $W_2(k)$, was then computed as the product of the adjusted basic weight for kth RU and the nonresponse-undercoverage adjustment factor for the cell containing the RU.

The poststratification adjustment factor is computed at the person level. As each person within an RU is included in the sample, the nonresponse-undercoverage adjusted weight for a sample person is the nonresponse-undercoverage adjusted weight for the RU in which the person resides. Each person was classified as responding or nonresponding as discussed in the section on attrition imputation.

Initially, 60 poststrata were formed by cross-classifying the following three variables: age (15 levels), race (black or all other), and sex (male or female). One poststratum (black males over 75 years of age) had fewer than 20 respondents, so it was combined with an adjacent poststratum (black males 65–74 years of age), resulting in 59 poststrata.

Estimates based on the 1980 census of the U.S. civilian noninstitutionalized population by age, race, and sex for February 1, May 1, August 1, and November 1, 1980, were obtained from the U.S. Bureau of the Census. The mean of the mid-quarter population estimates for each of the poststrata was computed and used as the 1980 average target population in calculating the poststrata adjustment factors. Similarly, survey based estimates of the average poststrata population were developed using the nonresponse-undercoverage adjusted weights. First, a survey based estimate of the target population of poststratum p at mid-quarter q was computed as follows:

$$S(p,q) = \sum_{j \in p} \delta(q,j) W_2(j)$$

where

$$\delta(q,j) = \begin{cases} 1 & \text{if survey respondent } j \text{ was in scope at mid-quarter } q \\ 0 & \text{otherwise} \end{cases}$$

$W_2(j)$ = nonresponse-undercoverage adjusted weight of respondent j.

The survey based estimate of the 1980 average population for poststratum p was computed as the mean of the four mid-quarter estimates, or

$$S(p) = \frac{1}{4} \times \sum_{q=1}^{4} S(p,q)$$

The poststratification adjustment factor for the pth poststratum was then computed as

$$A_2(p) = \frac{C(p)}{S(p)}$$

where $C(p)$ = mean 1980 population for poststratum p based on U.S. Bureau of Census data. The poststratified weight for the jth respondent, denoted by $W_3(j)$, was then computed as the product of the nonresponse-undercoverage adjusted weight for the jth respondent and poststratification adjustment factor for the poststrata containing the respondent.

For many analyses, estimates of the average 1980 population are required. Since some respondents were eligible for only a portion of the year, the aggregation of the W_3 weights for all respondents is an estimate of the total number of persons who were in the civilian noninstitutionalized population of the United States in 1980 and is an overestimate of the average 1980 population size. Therefore an adjustment factor was calculated for each respondent to reflect the proportion of time during 1980 the respondent was eligible to report NMCUES data. This adjustment factor for respondent j is

$$A_3(j) = \frac{E(j)}{366}$$

where $E(j)$ = number of days during 1980 respondent j was in scope.

Estimators

Weighted linear estimators are used for estimating population and population subdomain aggregates. Suppose, for example, an estimate of the parameter "total doctor visit charges for persons 65 years and over" is desired.

The estimator of this parameter, denoted by $\hat{\theta}$, is given by

$$\hat{\theta} = \sum_{j \in A} W_3(j) X_j$$

where A is the collection of all NMCUES respondents 65 years and over and X_j is the total doctor visit charges reported by the jth respondent during the eligible period.

Ratio estimators are used for estimating population and population subdomain parameters such as means, proportions, and rates. As will be illustrated in the following examples, care must be taken in determining the appropriate weights to be used in the denominator of the ratio estimator.

Example 1—The NMCUES estimator for the proportion of doctor visits attributable to persons 65 years of age and over is given by

$$\hat{\theta} = \frac{\sum_{j \in A} W_3(j) Y_j}{\sum_{\text{All } j} W_3(j) Y_j}$$

where Y_j is the number of doctor visits reported by the jth respondent.

Example 2—The NMCUES estimator for mean annual doctor visit charges for persons 65 years of age and over is given by

$$\hat{\theta} = \frac{\sum_{j \in A} W_3(j) X_j}{\sum_{j \in A} W_3(j) A_3(j)}$$

where X_j is the total doctor visit charges reported by the jth respondent during his or her eligible period, and $A_3(j)$ is in the time adjustment factor for the jth respondent. The time adjustment factor is used in this situation to adjust for the fact that the jth respondent contributed doctor visit charges to the numerator only during the period of eligibility.

Reliability of Estimates

The estimates presented in this report are based on a sample of the target population rather than on the entire population. Thus the values of the estimates may be different from values that would be obtained from a complete census. The difference between a sample estimate and the population value is referred to as the sampling error, and the expected magnitude of the sampling error is measured by a statistic called the standard error. Estimated standard errors for the estimates presented in

Table 8–13 are shown for each estimate. For estimates in Tables 1–7, the standard errors must be computed by using design effects shown in Table I.

The SESUDAAN (Shah, 1981) standard error estimation software package was used to produce the estimates of standard errors. SESUDAAN is a Taylor Series procedure developed and released by the Research Triangle Institute. It runs within the Statistical Analysis System (SAS Institute, Inc., 1982).

It should also be noted that in addition to sampling error, the estimates presented in this report are subject to nonsampling errors such as biased interviewing and reporting, undercoverage, and nonresponse. The standard error does not provide an estimate of these types of errors. However, as discussed in preceding sections, every effort was made to minimize these errors.

Suppose that $\hat{\theta}$ is an unbiased estimator for the parameter θ, and $S_{\hat{\theta}}$ is a consistent estimator for the standard error of $\hat{\theta}$. Under appropriate central limit theorem assumptions regarding $\hat{\theta}$, the statistic $Z = (\hat{\theta} - \theta)/S_{\hat{\theta}}$ has an approximate standard normal distribution for large samples. Thus, an approximate $(1 - \alpha) \times 100$ percent confidence interval for θ is given by

$$(\hat{\theta} + z_{\alpha/2}S_{\hat{\theta}},\ \hat{\theta} + z_{1-\alpha/2}S_{\hat{\theta}})$$

where $z_{\alpha/2}$ and $z_{1-\alpha/2}$ are the appropriate values from a standard normal table. As an example, Table 8 shows the estimate that people hospitalized one or more times in 1980 had 10.6 physician visits per person per year. The standard error of that estimate is 0.3 visits per person per year. Since 68 percent of the area under the normal curve is within 1 standard error of the midpoint, 95 percent of the area within 2 standard errors, and 99 percent of the area within 2.5 standard errors, we infer the following: Chances are 68 out of 100 that the true value is 10.6 ± 0.3, or between 10.3 and 10.9; chances are 95 out of 100 that the true value is $10.6 \pm 2\ (0.3)$, or between 10.0 and 11.2; and chances are 99 out of 100 that the true value is $10.6 \pm 3\ (0.3)$, or between 9.7 and 11.5.

Confidence intervals for the difference of two parameters can be constructed in a similar manner. Suppose θ_1 and θ_2 are the values of the parameter of interest in two mutually exclusive population subgroups. If $\hat{\theta}_1$ and $\hat{\theta}_2$ are unbiased estimators of θ_1 and θ_2, respectively, then $\hat{d} = \hat{\theta}_1 - \hat{\theta}_2$ is unbiased for $d = \theta_1 - \theta_2$ and

$$\mathrm{Var}(\hat{d}) = \mathrm{Var}(\hat{\theta}_1) + \mathrm{Var}(\hat{\theta}_2) - 2\ \mathrm{Cov}(\hat{\theta}_1,\hat{\theta}_2)$$

Unfortunately, the estimation of $\mathrm{Var}(\hat{d})$ presents a problem because it is not possible for the National Center for Health Statistics to provide the reader with covariance estimates for all possible pairs of subdomains of potential interest. However, if it is reasonable to assume that $\mathrm{Cov}(\hat{\theta}_1,\hat{\theta}_2) = 0$, the standard error of $\hat{d}$ can be estimated by

$$S_{\hat{d}} = \sqrt{S^2_{\hat{\theta}_1} + S^2_{\hat{\theta}_2}}$$

Then, under appropriate central limit theorem assumptions regarding d, the statistic $Z_d = (\hat{d} - d)/S_{\hat{d}}$ has an approximate standard normal distribution for large samples, and the interval

$$(\hat{d} + z_{\alpha/2}S_{\hat{d}},\ \hat{d} + z_{1-\alpha/2}S_{\hat{d}})$$

is an approximate $(1 - \alpha) \times 100$ percent confidence interval for the difference d.

By way of example, suppose we wanted to construct a 95-percent confidence interval for the difference between the number of visits per person per year for people 45–64 years of age and 65 years of age and over who were hospitalized one or more times during the year. From Table 8, the visit rates are 11.6 and 12.7 for people 45–64 years of age and 65 years of age and over, respectively, with corresponding standard errors of 0.68 and 0.71, so that

$$\begin{aligned} \hat{d} &= \hat{\theta}_1 - \hat{\theta}_2 \\ &= 11.6 - 12.7 \\ &= -1.1 \\ S_{\hat{d}} &= \sqrt{(0.68)^2 + (0.71)^2} \\ &= \sqrt{0.97} \\ &= 0.98 \end{aligned}$$

Then as $\alpha = 0.05$, it follows that $z_{\alpha/2} = -1.96$ and $z_{1-\alpha/2} = 1.96$, so that the 95-percent confidence interval for the difference of interest is $(-3.1, 0.9)$.

The reader should be aware that the assumption that $\mathrm{Cov}(\hat{\theta}_1,\hat{\theta}_2) = 0$ is frequently not true for complex sample surveys. This warning is especially germane for sample designs, such as the NMCUES design, that rely on cluster sampling at one or more stages of sample selection. If $\mathrm{Cov}(\hat{\theta}_1,\hat{\theta}_2)$ is positive, the confidence interval will tend to be too large, and hence the confidence level will be understated. More seriously, if $\mathrm{Cov}(\hat{\theta}_1,\hat{\theta}_2)$ is negative, the confidence interval will tend to be too small, and the confidence level will be overstated.

The statistics Z and Z_d can be used to test hypotheses. For example, the size α critical region for the composite hypothesis

$$H_0 : d \geq d_0.$$

versus

$$H_A : d < d_0$$

is given by

$$Z_{d_0} = \frac{\hat{d} - d_0}{S_{\hat{d}}} \leq z_\alpha$$

As an example, suppose that there is an a priori reason to believe that the physician visit rate for people 45–64 years of age and hospitalized one or more times during 1980 (θ_1) is less than the rate for people 65 years of age and over (θ_2). Letting $d = \theta_1 - \theta_2$, this can be restated as a formal hypothesis as

$$H_0 : d \geq 0$$

versus

$$H_A : d < 0$$

Note that what is believed to be the true state of nature is reflected by a one-sided alternative.

From Table 8 it is seen that

$$\hat{d} = 11.6 - 12.7$$

$$= -1.1$$

and

$$S_{\hat{d}} = \sqrt{(0.68)^2 + (0.71)^2}$$

$$= 0.98$$

so that $Z_{d_0} = -1.12$. Then, assuming that the level of significance had been set at $\alpha = .01$ (which implies the one-tailed critical value as $Z_\alpha = -2.33$), H_0 would be rejected in favor of H_A as $Z_{d_0} \leq Z_\alpha$.

As discussed in connection with the construction of confidence intervals, the assumption that $\mathrm{Cov}(\hat{\theta}_1, \hat{\theta}_2) = 0$ must be carefully evaluated. If, in fact, the covariance is positive, the size of the test will be smaller than α; if the covariance is negative, the size of the test will be larger than α. The reader desiring to conduct more sophisticated analysis of the NMCUES data is advised to consult with a statistician knowledgeable in the analysis of data from complex sample surveys.

Approximate standard errors for Tables 1–7 may be obtained by using the formula

$$S_{\hat{\theta}} = \mathrm{DEFF}\sqrt{\frac{\hat{\theta}(1 - \hat{\theta})}{n}}$$

where DEFF = design effect

$\hat{\theta}$ = proportion of people with an attribute

n = sample size on which the estimate θ is based

Design effects are shown in Table I. An example of how to use the design effect table is as follows: During 1980, 5.9 percent of the people under 17 years of age experienced one or more hospitalizations (Table 1). The estimate is based on a sample of 5,047 people. As shown in Table I, the DEFF for estimates in Table 1 is 1.2. Therefore, $S_\theta = 0.004$ or 0.4 percent. In other words, the estimate of 5.9 percent has a standard error of 0.4 percent.

Physician Visits Associated With Hospitalization in Table 9

The data in Table 9 are based on a sample of 1,783 persons who were hospitalized and visited a physician during 1980. The number of visits totaled 18,752 and included hospital emergency rooms and outpatient departments as well as visits to physician offices. Hospitalizations for normal deliveries and visits to nonphysician independent providers were excluded.

To obtain the distributions shown in Table 9, each medical visit record was programmed to store the visit date and all hospital discharge dates (up to nine) for each person. Each visit was linked to a hospitalization by calculating the number of months each visit occurred before or after the hospitalization. The visit closest to a hospitalization was assigned a value containing the number of months either before or after the closest hospitalization. For those visits equivalent in months from two hospitalizations (for example, a visit 1 month after the first hospitalization and 1 month before the record hospitalization), the visit was assigned the 1 month after code, thus linking it with the first hospitalization.

Each visit was weighted by the basic person weight assigned to the individual having the visit. The visit was annualized by multiplying its weighted value by 12. The mean number of visits per person was derived by dividing the annualized weighted visit count by the time-adjusted weights of the 1,783 people with hospitalizations and visits.

Table I

Design effects for standard errors of estimated percents shown in Tables 1–7

Table number	Number of times hospitalized				
	Total	0	1	2	3 or more
	Design effects				
1	1.2	1.2	1.2	1.2	1.2
2	1.1	-	1.1	1.1	1.1
3	2.9	2.9	1.4	1.2	1.1
4	2.9	2.9	1.5	1.3	1.0
5	2.2	2.2	1.1	1.1	1.1
6	1.8	1.8	1.3	1.2	1.2
7	2.9	2.9	1.1	1.1	1.1

Appendix II. Definition of Terms

Age—The age of the person as of January 1, 1980. Babies born during the survey period were included in the category "under 5 years."

Bed Disability Days—Days during which a person had an illness or an injury that kept the person in bed for more than half the day. All hospital days for inpatients are considered days of bed disability.

Core Questionnaire—The basic interview instrument used during each interview to obtain data about health, health care, charges for health care, sources of payment, and health insurance coverage.

Emergency Department—A hospital facility organized to provide medical services to people needing immediate medical or surgical intervention. The emergency department is staffed 24 hours a day. People receiving care in the emergency department may be admitted into a hospital.

Emergency Department Visit—A face-to-face encounter between a patient (not necessarily ambulatory) and a medical person. Emergency department visits include encounters by patients transported to the emergency department by police or the emergency medical service. The visit may result in a hospital admission.

Expenditures for Medical Care—Expenditures for the following:

- Inpatient doctor visits occurring during a hospital stay.
- Hospital stays for which the hospital was classified as a short-stay facility and the discharge date was during 1980.
- Emergency department visits.
- Hospital outpatient department visits.
- Physician visits in practitioner's office.
- Other medical expenses.

Excluded from the expenditures for medical care are expenditures for visits to nonphysicians working independently (e.g., physical therapist) and prescribed medicines.

Health Insurance—Coverage provided by any entity other than the provider, consumer, or consumer's family that assumes at least part of the financial responsibility for care. *Types of insurance coverage* are as follows:

- *No Insurance*—Not covered by any surveyed insurance categories.
- *Private Only*—Includes persons who reported private insurance as their only coverage, without regard to the number of private insurance plans. Private insurance includes commercial insurance, Blue Cross and Blue Shield plans, health maintenance organizations, union- and employer-sponsored programs, Champus, Champva, and other prepayment programs.
- *Public Only*—Covered by at least one of the following: Medicare, Medicaid, Indian Health, or other public program (includes local and State welfare programs and public health department services). Persons included in this category were not covered by private insurance.
- *Public and Private*—Persons covered by at least one public and one private insurance program.

Hospital Admissions—The formal acceptance by a hospital of a patient who is provided room, board, and regular nursing care in a unit of the hospital. Included as a hospital admission is a patient admitted to the hospital and discharged on the same day. Also included is a hospital stay resulting from an emergency department visit.

Hospital Outpatient Department—A hospital-based ambulatory care facility organized to provide nonemergency medical services. Persons receiving services do not receive inpatient nursing care. Examples of outpatient departments or clinics are pediatric, obstetrics and gynecology, eye, and psychiatric.

Hospital Outpatient Department Visit—A face-to-face encounter between an ambulatory patient and a medical person. The patient comes to a hospital-based ambulatory care facility to receive services and departs on the same day. If more than one department or clinic is visited on a single trip, each department or clinic visited is counted as a separate visit.

Household—Occupants of a housing unit or group quarters that was included in the sample. This could have been one person, a family of related people, a number of unrelated people, or a combination of related and unrelated people.

Housing Unit—A group of rooms or a single room occupied or intended for occupancy as separate living quarters; that is, (1) the occupants did not live and eat with any other persons in the structure, and (2) there was either direct access from the outside or through a common hall, or there were complete kitchen facilities for the use of the occupants only.

Institution—A place providing room, board, and certain other services for the residents or patients. Correctional institutions, military barracks, and orphanages were always considered institutions for NMCUES. Places that provided health care were also identified as institutions if they provided either nursing or personal care services. Certain other facilities licensed, registered, or certified by a State agency or affiliated with a Federal, State, or local government agency were also defined as institutions. People residing in institutions were not included in the household samples.

Key Person—A key person was (1) an occupant of a national household sample housing unit or group quarters at the time of the first interview; (2) a person related to and living with a State Medicaid household case member at the time of the first interview; (3) an unmarried student 17–22 years of age living away from home and related to a person in one of the first two groups; (4) a related person who had lived with a person in the first two groups between January 1, 1980, and the round 1 interview, but was deceased or had been institutionalized; (5) a baby born to a key person during 1980; or (6) a person who was living outside the United States, was in the Armed Forces, or was in an institution at the time of the round 1 interview but who had joined a related key person.

Lives Alone—Only person in the family.

Living Arrangement—Based on information obtained at the beginning of the survey.

Marital Status—Marital status for each person 17 years of age and over was as indicated by the household respondent.

NMCUES—National Medical Care Utilization and Expenditure Survey.

National Household Component—One component of NMCUES, consisting of multiple household interviews with an area probability sample of people in the noninstitutionalized population of the United States in 1980.

Nonkey Person—A person related to a key person who joined him or her after the round 1 interview but was part of the civilian noninstitutionalized population of the United States at the date of the first interview.

Nuclear Family—More than one person in family and each person is either head of household, spouse, or child.

Other Relative—More than one person in family and person is either the parent, grandchild, or other relative of the head of household.

Persons—Usages such as per person, number of persons, and percent of persons refer to person-year equivalents; that is, persons weighted by the proportion of the year they were part of the noninstitutionalized population of the United States.

Physician Visits—All visits in which the provider was a medical doctor (M.D.), doctor of osteopathy (D.O.), or a person supervised by an M.D. or D.O. (e.g., nurse, nurse practitioner, or physician assistant) and which occurred at any place of care except in a hospital as an inpatient. Telephone calls are excluded.

Prescribed Medicine—Any medicine obtained on a doctor's written prescription or telephoned order to a pharmacist, any refill of previous prescriptions, and any medicine given by a doctor (or nurse) to a person to take home. Medicine or injections administered to a person in a doctor's office or in a medical facility are not included.

PSU Number—The primary sampling unit number used to identify the first stage of the sample selection process.

Principal RU Respondent—The member of the reporting unit who provided most of the information for the people in the reporting unit.

Proxy Respondent—As used in this survey, a proxy respondent was a person who provided information for people in the reporting unit but who was not a member of the reporting unit. A proxy respondent was used only when no member of the reporting unit could supply the information because of physical or mental incapacity.

RU—Reporting unit.

Reporting Unit—The basic unit for reporting data in the household components of NMCUES. A reporting unit consisted of all related people residing in the same housing unit or group quarters. One person could give information for all members of the reporting unit.

Restricted Activity Days—Days during which a person was limited in the performance of his/her usual activities. The number of restricted activity days was computed by adding together the number of reported bed disability days, work-loss days, and cut-down days and subtracting the number of work-loss days spent in bed.

Round—A round was the administrative term used to designate all interviews that occurred within a given period of time and that used the same instruments and procedures.

Segment Number—A number used to identify the sample unit at a stage in the sample selection.

Sex—Recorded by the interviewer in the initial NMCUES interview.

Work-Loss Days—Scheduled work days (full- or part-time) during which a person age 17 or over lost more than half a day because of an illness or injury.

*U.S. GOVERNMENT PRINTING OFFICE : 1985 0-461-359/10002

National Medical Care Utilization and Expenditure Survey

The National Medical Care Utilization and Expenditure Survey (NMCUES) is a unique source of detailed national estimates on the utilization of and expenditures for various types of medical care. NMCUES is designed to be directly responsive to the continuing need for statistical information on health care expenditures associated with health services utilization for the entire U.S. population.

NMCUES will produce comparable estimates over time for evaluation of the impact of legislation and programs on health status, costs, utilization, and illness-related behavior in the medical care delivery system. In addition to national estimates for the civilian noninstitutionalized population, it will also provide separate estimates for the Medicaid-eligible population in four States.

The first cycle of NMCUES, which covers calendar year 1980, was designed and conducted as a collaborative effort between the National Center for Health Statistics, Public Health Service, and the Office of Research and Demonstrations, Health Care Financing Administration. Data were obtained from three survey components. The first was a national household survey and the second was a survey of Medicaid enrollees in four States (California, Michigan, Texas, and New York). Both of these components involved five interviews over a period of 15 months to obtain information on medical care utilization and expenditures and other health-related information. The third component was an administrative records survey that verified the eligibility status of respondents for the Medicare and Medicaid programs and supplemented the household data with claims data for the Medicare and Medicaid populations.

Data collection was accomplished by Research Triangle Institute, Research Triangle Park, N.C., and its subcontractors, the National Opinion Research Center of the University of Chicago, Ill., and SysteMetrics, Inc., Berkeley, Calif., under Contract No. 233–79–2032.

Co-Project Officers for the Survey were Robert R. Fuchsberg of the National Center for Health Statistics (NCHS) and Allen Dobson of the Health Care Financing Administration (HCFA). Robert A. Wright of NCHS and Larry Corder of HCFA also had major responsibilities. Daniel G. Horvitz of Research Triangle Institute was the Project Director primarily responsible for data collection, along with Associate Project Directors Esther Fleishman of the National Opinion Research Center, Robert H. Thornton of Research Triangle Institute, and James S. Lubalin of SysteMetrics, Inc. Barbara Moser of Research Triangle Institute was the Project Director primarily responsible for data processing.

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402