CORRECTING FOR UNDERCOVERAGE BIAS
IN RANDOM DIGIT DIALED NATIONAL HEALTH SURVEYS

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This paper reports the preliminary results of an investigation into the bias that results from the exclusion of nontelephone households in national health interview surveys. Specifically, the primary purpose of the study is to assess the error in national estimates of selected health characteristics based on health interview surveys of households with telephones. There are four general areas to the investigation: (1) a comparison of telephone and nontelephone households in terms of sociodemographic characteristics; (2) a comparison of individuals in telephone and nontelephone households in terms of selected health characteristics; (3) an assessment of the impact of the exclusion of nontelephone households on national estimates for selected health characteristics of the population; and (4) the development of **post-stratified ratio adjustments** as a correction for the error introduced by the exclusion of the nontelephone households.

While there have been several previous investigations of the sociodemographic characteristics of telephone and nontelephone households [3,5-7], only limited information is available relating to health characteristics and to the development of reliable procedures for adjusting for the bias resulting from the exclusion of nontelephone households in random digit dialed surveys. If data obtained from surveys of households with telephones are to be used for purposes of deriving estimates for the population of the U.S. or of selected geographic areas, adjustment procedures of the nature addressed in this paper are required.

Source of Data

This research is based on data from the 1976 National Health Interview Survey (HIS). The HIS is a continuous survey of the civilian noninstitutionalized population of the United States. Its purpose is to provide national data on the incidence of illness and injury, the prevalence of diseases and impairments, the extent of disability, the utilization of health services, and other health-related topics.

Interviews are conducted each week throughout the year in a probability sample of households. The sampling plan for the survey follows a multistage probability design which permits a continuous sampling of households. The sample is designed in such a way that the sample of households interviewed each week is representative of the target population, and that weekly samples are additive over time. The data are collected through a personal household interview conducted by interviewers employed and trained by the U.S. Bureau of the Census according to procedures specified by the National Center for Health Statistics (NCHS). The usual annual HIS sample consists of approximately 40,000 eligible occupied households consisting of around 115,000 individuals. The completion rate for the eligible households averages between 96 and 97 percent.

Telephone Coverage of Households in the United States

Beginning in 1963, each household in the HIS sample was asked to provide a telephone number ("What is the telephone number here?"). Each schedule is coded according to the telephone status of the household (phone available-number provided; phone available-number not provided; no telephone; telephone status not ascertained). Telephone status is generally ascertained for more than 99 percent of the completed interviews.

The percents of HIS households reported as not having telephone coverage are given below for the years 1963 through 1977. According to these estimates, 19 percent of households in the United States were without telephones in 1963. By 1970, this figure had dropped to less than 12 percent. In 1977, 8.4 percent of the HIS households were recorded as without telephones.

Percent of HIS Households Reported as Nontelephone

1963 - 19.2%	1970 - 11.6%	1974 - 9.6%
1967 - 15.4%	1971 - 11.1%	1975 - 9.6%
1968 - 13.9%	1972 - 10.5%	1976 - 9.5%
1969 - 12.7%	1973 - 10.2%	1977 - 8.4%

The data presented in the remainder of this report are based on the 1976 HIS. For that year, completed interviews were obtained from 96.3 percent of the 41,559 eligible households. Telephone status was ascertained for 99.4 percent of the completed interviews, resulting in a sample of 39,759 households consisting of 112,573 persons. Of these households, 90.5 percent were recorded as with telephone coverage, and 9.5 percent as without coverage.

Sociodemographic Characteristics

Data on telephone coverage for selected characteristics of households and individuals within households are presented in Tables 1-3. Households in the South, with 14 percent nontelephone, are less likely to have coverage than are those in the other three regions, each with 8 percent or less nontelephone. There is higher coverage in SMSA than in non-SMSA areas, with the highest percent of telephone households within the non-central city portion of SMSA's and the lowest coverage within rural-nonfarm areas. Nontelephone households are also more likely to be one-person households.

Heads of households without telephone coverage are disproportionately nonwhite and under 35 years of age. Ninety-two percent of the white heads of households have telephone coverage as contrasted to 79 percent for blacks. While young heads of households are disproportionately in nontelephone households (22.5% for ages 15-24 years and 11.9% for 25-34 years), there is little variation in coverage by age for those over 35 years of age (92% coverage or higher). Telephone ownership is higher for household heads who are widowed (92.8%) or are married and living with their spouse (93.5%) than for the never married (81.5%), divorced (85.4%),

or separated (71.7%). As would be expected, telephone coverage increases with increasing education and family income. The most important correlate of telephone ownership is family income, with coverage increasing from 74 percent for the lowest income category (less than $3,000) to 99 percent for the highest ($25,000 or more). Coverage for households with incomes of $10,000 or more is relatively complete at 95 percent or higher. The findings for all persons (Table 2 – "All Regions" column) are similar to those presented for heads of households, with the relationship between coverage and family income being even more pronounced.

These correlates of telephone coverage described above generally hold within each region. It is noteworthy, however, that for any given subgroup, a comparison among regions reveals minor differences except for the South, where coverage is almost always lower than for the other three regions. For example (Table 2), while blacks have lower coverage than whites in all four regions, only 75 percent of blacks in the South reside in telephone households, as contrasted to 85 percent or higher for the other three regions. Similarly, while telephone coverage increases with increasing family income within each region, the level of coverage in the South is lower for each family income category than in the other three regions.

Given that family income is the major correlate of telephone coverage the next step is to assess the extent to which the relationships between telephone ownership and other sociodemographic variables diminish when family income is controlled. The issue thus becomes one of the degree of variation in coverage within categories of family income for selected sociodemographic variables. As would be expected, for any sociodemographic subgroup, telephone coverage increases with increasing income (Table 3). Within specific income categories, however, the following general pattern emerges. The correlates of telephone ownership discussed previously still exist to a limited degree for the lower income groups, but tend to diminish in magnitude with increasing family income. With few exceptions, for households with family incomes of $10,000 or more, there is very little variation among categories for any sociodemographic variable; in effect, telephone coverage is relatively complete for all population subgroups in households with family incomes of $10,000 or more.

For persons 65 years of age or more, telephone coverage is relatively complete regardless of income level, with 85 and 93 percent coverage for the lowest two income categories, and 96 percent or higher for the other income groups. These data suggest that if level of coverage were the only consideration, it would be difficult to reject the use of random digit dialing in planning a survey of the elderly.

In summary, there are numerous differences in sociodemographic characteristics between households and persons with telephone coverage and those without coverage. However, it should be kept in mind that nontelephone households represent less than ten percent of all households and that many of the subgroups with major telephone-nontelephone differences constitute a very small proportion of the total population. Consequently, estimates of most sociodemographic characteristics based only on telephone households are very similar to estimates based on both telephone and nontelephone households. For surveys of many population subgroups (such as the elderly), the coverage which can be obtained through random digit dialing may be well within accuracy requirements.

Health Characteristics

In the previous section, the nature and direction of bias in sociodemographic characteristics of the population resulting from the exclusion of nontelephone households were examined. What remain to be investigated are differences between telephone and nontelephone populations in health characteristics and the extent to which the exclusion of nontelephone households would introduce bias into national estimates of these characteristics.

The first two columns of Table 4 provide values for selected health characteristics for persons in telephone and nontelephone households. In general, the observed differences are of the type and in the direction expected, given that the nontelephone population consists disproportionately of persons in low income families. Relative to the population with telephone coverage, the nontelephone population is more likely to be limited in activity because of chronic conditions, to have higher rates of acute conditions and associated restricted activity and bed disability, and lower rates of utilization of health services. The most pronounced difference relates to the utilization of dental services, which is the health characteristic most highly correlated with family income. It should be noted that as was true for the sociodemographic characteristics, the differences between the values for the telephone population and the total population are generally small.

With minor exceptions, the relationships described above for the total population are found within each region and each age group (Table 5). For example, within age groups, persons with telephone coverage have higher rates of utilization of physician and dental services and lower rates of activity limitation and restricted activity relative to persons in nontelephone households.

Selected health characteristics by family income are also presented in Table 5. Within each income group, persons in nontelephone households have lower rates of utilization of physician services and dental services. However, rates of activity limitation due to chronic conditions and days of restricted activity are lower for the nontelephone population within most income groups. The overall rates for these latter two variables are higher for the nontelephone than for the telephone population because the nontelephone population is disproportionately in the lower income categories, which have the highest rates of activity limitation.

Rates of physician visits by both age and family income are given in Table 6. With few exceptions, within each age-income category the nontelephone population has lower rates of

utilization of physician services than does the telephone population.

In summary, the health-related characteristics of persons in nontelephone households are very different from those of persons in telephone households. It is clear from the data presented that there are factors in addition to age and income which should be taken into account in any attempt to adjust for the bias introduced by the exclusion of nontelephone households. This is taken up in some detail in the section which follows.

Correcting for the Population Without Telephones

The previous sections of this paper have investigated the sociodemographic and health characteristics of the populations with and without telephones as reported in the HIS. This section examines the differences in the estimated health characteristics of the United States population produced by excluding the nontelephone households from the HIS sample. The demographic characteristics of the nontelephone population are then utilized to adjust for the differences in the health characteristics.

Differences between the health characteristics (rates and proportions) for the total population and the telephone population are shown in Table 4. Most of the differences are quite small because the telephone population represents over 90 percent of the total population. The differences shown can be attributed largely to the bias due to the exclusion of nontelephone households, since the estimates for the total and telephone populations are highly correlated and the variances of the differences are therefore small. The health characteristics with the largest biases (about 5 percent) due to the exclusion of the nontelephone households are the number of dental visits and the percent of persons seeing a dentist in the past six months. The characteristics with the next largest biases (about 2 percent) are restricted activity days, disability days, and limitation in major activity. All of the other biases due to the noncoverage of the households without telephones are 1 percent or less. The large biases for dental characteristics can be explained by the high correlation with family income.

In the HIS, the estimator used contains a post-stratification adjustment factor [1] which ratio adjusts the estimates within 60 separate age-sex-color cells to an independent estimate of the population of each cell for the survey period. The independent population estimates are provided by the Bureau of the Census. The effect of the ratio adjustment is to make the sample more closely representative of the civilian noninstitutionalized population by age, sex, and color. This procedure not only reduces the variance of the estimates, but also corrects for the undercoverage in the HIS sample for the age, sex, and color subpopulations. To the extent that the health characteristics are correlated with these demographic variables, the ratio adjustment also reduces the bias related to the undercoverage. This same type of approach is proposed for the telephone population sample to correct for the bias due to the exclusion of the nontelephone population

Two criteria were used to select the demographic variables for post-stratifying the telephone

population. The bias of an estimate is a function of both the difference of the health characteristic for the telephone and nontelephone populations, and the magnitude of the undercoverage for the subdomains being studied. For example, if one is interested in studying the South's black population, a telephone survey could only sample 75 percent of the total population. Even small differences in the health characteristics for the nontelephone population would produce a substantial bias. Thus, the demographic variables selected to correct for the biases should be highly correlated with the health characteristic under study or represent domains which have large undercoverages. The three variables which appear to have both of these characteristics are region, income, and race. An unpublished regression study by one of the authors showed that for a few selected health characteristics, the best predictor variables were median income and percent nonwhite. Region is an obvious variable needed for adjusting the telephone population estimates because of the large number of households without telephones in the South. Using the income groups less than $3,000, $3-4,999, $5-6,999, $7-9,999, $10-14,999, $15,000 or more, and unknown; the four Census regions Northeast, North Central, South, and West; and the color categories white and nonwhite, a total of 56 cells were used to ratio adjust the telephone population estimates. The ratio-adjusted estimate of a total for the telephone population is given by

$$X''_{TA} = \sum_{Cell}^{56} \frac{X'_{TC}}{Y'_{TC}} Y'_{NC}$$

where

X'_{TC} = estimated total for the telephone population

Y'_{TC} = estimated number of persons in cell C for telephone population

Y'_{NC} = estimated number of persons in cell C for total population

The adjusted estimates are shown in Tables 4, 7, and 8. Also shown in the tables are adjusted estimates using the age-sex-color cells used to adjust the HIS sample. One factor which complicates the analysis is the fact that X'_{TC}, Y'_{TC}, and Y'_{NC} are themselves ratio adjusted estimates produced from the HIS. These adjusted weighted estimates represent the best estimates available for the 56 population cells. Further research is being conducted on the effects of adjusting the unweighted data from the HIS. Such adjustments correct for both the telephone undercoverage and the population undercoverage simultaneously.

The results suggest that the ratio adjustments do not always produce better estimates for the health characteristics shown. One reason is that adjustments are made for the numerator and denominator of a rate or ratio (e.g., number of physician visits per person) and the totals in the numerator and denominator may be adjusted too high and too low, respectively. Another reason is that not all of the variation for a health characteristic can be explained by the three selected demographic variables. The variable not included in the adjustment by income-region-color which seems to have the most impact is age.

Within the income-region-color (IRC) cells, the health characteristics can vary significantly by age. Table 7 provides a very interesting illustration. For limitation of major activity due to a chronic condition, the IRC adjustment behaves well within each of the age groups, but the adjusted estimate for all age groups substantially overestimates the HIS estimate for the total population. This result was caused by an overestimate of the number of persons in the 65 years and over age group. While the proportion of persons in this age group with a chronic condition causing a limitation in their major activity was accurately adjusted, the proportion for the total population was not because of the over-representation of this age group.

Even with the above qualifications, the IRC adjustment performed reasonably well, especially for the health characteristics with the largest biases. For the overall estimates of the 12 characteristics examined (Table 4), the IRC telephone adjusted estimate was closer to the total population estimate four times, the same four times, and worse four times. A closer inspection reveals, however, that for the cases where the adjusted estimate was slightly worse, the telephone estimate was already very close to the total population estimate, and the cases where an improvement was observed corresponded to the characteristics with the larger biases.

The effect of the age-sex-color (ASC) ratio adjustment on the telephone estimates was small in most cases and often was in the opposite direction of the IRC adjustment. It seems obvious that, in order to make any substantial adjustments to the telephone estimates, income and region must be used.

The effect of the two ratio adjustments by age is shown in Table 7 for percent seeing a dentist and percent with limitation in major activity due to a chronic condition. Within each age group the IRC adjustment performed well and always better than the ASC adjustment. Table 8 can be used to examine the two ratio adjustments across regions. In this table the IRC adjustment was better in all but one case. These tables indicate that the adjusted estimates are better than the nonadjusted estimates, but would be improved significantly if age were incorporated into the ratio adjustment. An investigation of an income-age-color adjustment is planned for the future.

The standard errors shown for the total population estimates in Tables 4, 7, and 8 can be used to approximate the ratio of the bias to the standard error. This provides some insight into the relative importance of the biases. Many of the estimated biases are as large or larger than the corresponding standard errors (in a few cases, two and three times larger). This indicates that in random digit dialed surveys with sample sizes as large as the HIS sample, the bias due to under-coverage could be a major source of error and should not be ignored.

In summary, it appears that ratio adjustments can be used to improve the estimates obtained from random digit dialed telephone surveys. It also seems clear that further improvements in the ratio estimators are possible. The authors plan to refine the post-stratified ratio adjustment by incorporating age into the income-region-color adjustment. Appropriate multivariate analyses also will be conducted in order to further refine the ratio estimator. In addition, the properties of the post-stratified ratio estimator, such as the variance and the bias, will be investigated. A recent paper by Doss, et al.[2] presents an exact small sample theory for post-stratification which may prove relevant to this research. Comparisons with other imputation procedures such as multivariate raking [4] are also planned as future research.

Acknowledgements

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Table 1. Household Telephone Ownership by Selected Household
Characteristics: Health Interview Survey, 1976

Household Characteristic	Telephone Households	Nontelephone Households	Sample Size
All Households	90.5%	9.5%	39,759
Region			
Northeast	93.2	6.8	9,065
North Central	92.7	7.3	10,672
South	86.1	13.9	12,658
West	91.6	8.4	7,364
Geographic Distribution			
SMSA			
3,000,000 or more	93.0	7.0	6,618
1,000,000-2,999,999	92.8	7.2	8,909
500,000-999,999	92.1	7.9	4,430
250,000-499,999	91.5	8.5	3,928
under 250,000	90.9	9.1	3,403
Other urban areas	88.8	11.2	5,111
Rural areas (except in SMSA)	85.1	14.9	7,360
SMSA-Non-SMSA			
SMSA - Central City	89.5	10.5	12,236
- Not Central City	94.6	5.4	15,052
Non-SMSA - Nonfarm	86.2	13.8	11,347
- Farm	90.6	9.4	1,124
Urban-Rural Residence			
Urban	91.6	8.4	28,822
Rural-Farm	91.6	8.4	1,388
Rural-Nonfarm	87.2	12.8	9,549
Number of Persons in Household			
One	84.6	15.4	8,423
Two	92.5	7.5	12,506
Three	91.8	8.2	6,942
Four	93.0	7.0	6,014
Five	92.4	7.6	3,218
Six	90.4	9.6	1,479
Seven	88.4	11.6	648
Eight or more	83.2	16.8	529

Table 2. Household Telephone Ownership by Selected Characteristics
of Individuals and Region: Health Interview Survey, 1976

Characteristic	Northeast	North Central	South	West	All Regions
	Percent in telephone households				
ALL PERSONS	94.2	93.7	85.9	92.7	91.1
Race					
White	95.2	94.2	88.5	93.1	92.5
Black	84.7	88.6	75.2	90.8	81.0
Other	95.8	91.1	60.5	87.1	86.1
Sex					
Male	93.9	93.0	85.0	91.9	90.4
Female	94.5	94.4	86.8	93.4	91.8
Age					
Under 5 years	89.3	88.9	77.5	87.3	84.8
5-14 years	93.5	94.0	83.0	92.7	90.1
15-24 years	92.3	91.3	81.8	89.6	88.2
25-34 years	93.6	92.9	84.5	92.2	90.2
35-44 years	95.8	95.5	89.3	94.9	93.5
45-54 years	95.4	96.1	92.2	96.2	94.7
55-64 years	97.1	96.4	91.4	95.5	94.9
65-74 years	96.7	95.6	92.1	94.7	94.6
75 years and over	96.4	95.0	90.8	94.9	94.0
Marital Status					
Under 17 years	92.6	93.0	82.3	91.6	89.1
Married-Spouse Present	96.7	95.3	89.0	94.9	93.5
Widowed	96.0	95.2	89.6	93.9	93.3
Never Married	92.5	92.3	85.6	89.8	90.1
Divorced	87.0	88.7	82.5	88.8	86.4
Separated	80.6	73.9	65.9	83.1	74.2
Married-Spouse Absent	84.3	82.3	79.5	86.7	82.8
Family Income					
Less than $3,000	75.9	77.0	62.6	72.7	70.1
$3,000 - $4,999	83.5	85.9	74.2	79.6	80.0
$5,000 - $6,999	88.5	85.1	71.6	84.9	80.7
$7,000 - $9,999	89.5	90.0	83.3	89.6	87.3
$10,000 - $14,999	97.0	96.6	92.2	95.7	95.1
$15,000 - $24,999	98.8	98.3	97.0	98.8	98.2
$25,000 or more	99.3	99.8	99.1	99.4	99.4
Unknown	95.0	92.6	83.7	91.2	90.0

Table 3. Household Telephone Ownership by Selected Characteristics
of Individuals and Family Income: Health Interview Survey, 1976

Characteristic	Less than $3,000	$3,000 -4,999	$5,000 -6,999	$7,000 -9,999	$10,000 -14,999	$15,000 or more
	Percent in telephone households					
ALL PERSONS	70.1	80.0	80.7	87.3	95.1	98.6
Race						
White	73.3	80.9	83.1	87.9	95.5	98.7
Black	62.3	76.8	70.1	83.7	91.6	95.7
Other	46.6	77.1	74.1	85.6	91.3	99.1
Sex						
Male	61.9	75.8	78.1	86.1	94.7	98.4
Female	75.2	83.0	82.8	88.4	95.6	98.8
Age						
Under 15 years	54.4	69.5	71.3	83.5	94.3	98.4
15-44 years	66.4	73.9	75.1	84.3	94.2	98.3
45-64 years	72.9	85.2	89.5	93.4	97.6	99.3
65 years and over	85.1	92.6	95.7	97.6	98.6	99.1
Marital Status						
Under 17 years	56.0	70.9	72.1	84.2	94.4	98.5
Married-Spouse Present	69.9	81.6	83.3	88.4	95.8	98.9
Widowed	86.7	93.7	93.5	95.5	97.1	98.6
Never Married	71.7	81.5	84.4	88.1	94.9	98.4
Divorced	66.7	80.0	82.6	90.2	94.6	97.0
Separated	55.1	67.0	71.1	84.2	89.8	90.6
Married-Spouse Absent	73.4	79.2	75.8	67.3	84.4	90.8

Table 4. Unadjusted and Ratio Adjusted Rates
for Selected Health Characteristics: United States, 1976

Characteristic	Nonphone Population	Telephone Population	Total Population	Telephone Adjusted by IRC[1]	Telephone Adjusted by ASC[2]
Number of physician visits per person per year	4.2	5.0	4.9 (.05)[3]	5.0	5.0
Number of dental visits per person per year	0.7	1.7	1.6 (.03)	1.6	1.7
Percent seeing a physician within the past 6 months	53.5	59.9	59.3 (1.7)	59.9	59.9
Percent seeing a dentist within the past 6 months	18.0	36.5	34.9 (1.2)	35.7	36.3
Number of hospital discharges per 100 persons per year	14.6	14.1	14.1 (.20)	14.3	14.0
Average length of stay for hospital discharges	7.8	7.9	7.9 (.24)	7.9	7.8
Percent with activity limitation due to a chronic condition	15.9	14.2	14.3 (.14)	14.8	13.9
Percent with limitation in major activity due to a chronic condition	12.6	10.6	10.8 (.15)	11.2	10.4
Days of restricted activity associated with acute conditions per 100 persons per year	1,175	934	957 (17)	947	934
Days of bed disability associated with acute conditions per 100 persons per year	579	429	443 (11)	435	429
Number of acute conditions per 100 persons per year	241	217	219 (3.7)	216	218
School loss days per child per year	5.6	5.2	5.2 (.20)	5.2	5.2
Population (millions)	19.9	190.7	210.6 (4.6)	210.6	210.6

[1]Income-Region-Color [2]Age-Sex-Color [3]Standard errors

Table 5. Selected Health Characteristics for Persons in Telephone and Nontelephone Households, by Region, Age, and Family Income: United States, 1976

Region, age, family income	Number of Physician Visits per Person Per Year			Percent Seeing a Dentist Within the Past 6 Months			Number of Hospital Discharges per 100 Persons per Year			Percent with Activity Limitation due to a Chronic Condition			Days of Restricted Activity per 100 Persons per Year		
	Total	Phone	Nonphone	Total	Phone	Nonphone	Total	Phone	Nonphone	Total	Phone	Nonphone	Total	Phone	Nonphone
TOTAL*	4.9	5.0	4.2	34.9	36.5	18.0	14.1	14.1	14.6	14.3	14.2	15.9	1823	1792	2116
Northeast	5.0	5.0	5.2	38.8	39.7	23.2	13.2	13.3	11.4	13.6	13.4	17.2	1630	1591	2151
North Central	4.8	4.8	4.5	36.5	37.6	18.5	14.5	14.3	17.3	14.0	13.7	18.4	1710	1657	2436
South	4.8	5.0	3.6	30.3	32.7	15.8	15.2	15.2	14.9	14.7	14.7	14.6	1870	1855	1945
West	5.5	5.5	4.8	35.6	36.9	19.6	12.9	12.9	13.0	15.0	15.0	16.0	2153	2151	2256
Under 15 years	4.2	4.3	3.3	34.2	36.7	15.0	7.0	7.1	6.7	3.6	3.5	3.8	1109	1118	1028
15-44 years	4.6	4.6	4.2	38.3	40.0	22.4	13.6	13.1	17.7	8.5	8.1	11.7	1384	1335	1855
45-64 years	5.7	5.7	5.6	34.6	35.8	13.5	17.1	17.0	18.3	24.3	23.3	42.4	2540	2428	4430
65 years and over	6.8	6.9	5.8	22.5	23.4	8.0	27.7	28.0	23.2	45.4	44.7	57.9	3998	3921	5167
Less than $3,000	6.0	6.4	5.1	22.5	24.7	17.6	20.1	20.5	19.3	29.7	30.9	26.3	3676	3661	3648
$3,000-4,999	5.8	6.0	5.0	23.1	24.4	17.8	20.0	21.3	14.8	28.2	30.1	20.4	2931	3033	2550
$5,000-6,999	5.0	5.3	3.6	23.3	25.2	15.8	16.6	17.4	13.0	19.5	21.1	12.8	2278	2456	1553
$7,000-9,999	4.8	4.9	4.2	28.1	29.4	18.5	15.6	15.4	16.6	15.4	16.2	9.7	1845	1933	1253
$10,000-14,999	4.8	4.9	3.3	33.0	33.6	19.9	13.8	14.0	10.8	11.3	11.5	7.2	1573	1583	1293
$15,000 or more	4.8	4.8	4.0	46.0	46.2	28.9	11.3	11.3	10.1	8.8	8.8	9.9	1284	1281	1343
Unknown	4.4	4.5	3.4	33.1	35.0	13.8	12.6	12.9	11.2	15.2	15.0	16.7	1909	1890	2171

*Includes unknown family income

Table 6. Number of Physician Visits Per Person Per Year by Family Income, Age, and Telephone Status: United States, 1976

Family Income	All Ages			Under 15 Years			15-44 Years			45-64 Years			65 Years and Over		
	Total	Phone	Nonphone	Total	Phone	Nonphone	Total	Phone	Nonphone	Total	Phone	Nonphone	Total	Phone	Nonphone
TOTAL	4.9	5.0	4.2	4.2	4.3	3.3	4.6	4.6	4.2	5.7	5.7	6.0	6.9	6.9	5.8
Less than $3,000	6.0	6.4	5.1	4.1	3.9	4.4	5.1	5.3	4.7	8.2	8.6	6.6	7.8	7.5	5.8
$3,000-4,999	5.8	6.0	5.0	4.2	4.3	4.0	5.1	5.2	5.0	7.4	7.7	5.5	7.0	6.9	7.5
$5,000-6,999	5.0	5.3	3.6	3.6	4.0	2.5	4.8	5.0	4.1	5.3	5.5	4.4	7.1	7.1	6.0
$7,000-9,999	4.8	4.9	4.2	3.6	3.7	2.7	4.5	4.5	4.5	6.0	5.9	7.5	7.0	7.1	*
$10,000-14,999	4.8	4.9	3.3	4.4	4.4	3.0	4.6	4.7	3.4	5.5	5.5	3.7	6.4	6.5	*
$15,000 and over	4.8	4.8	4.0	4.7	4.7	4.0	4.4	4.5	3.8	5.6	5.6	6.2	6.2	6.3	*
Unknown	4.4	4.5	3.4	3.4	3.5	2.7	3.9	4.0	3.4	4.7	4.7	4.1	6.7	6.8	4.2

*Figure does not meet standards of reliability.

Table 7. Ratio Adjusted Estimates of Percent of Persons Seeing a Dentist in Past 6 Months and with Limitation in Major Activity Due to a Chronic Condition, by Age: United States, 1976

Age	Total Population	Telephone Population	Telephone Adjusted by IRC[1]	Telephone Adjusted by ASC[2]
	Percent seeing a dentist			
All Ages	34.9 (1.2)[3]	36.5	35.7	36.3
Under 17 years	35.7 (2.2)	38.2	37.3	37.4
17-24 years	38.3 (3.3)	40.1	39.6	39.9
25-44 years	37.2 (2.4)	38.8	38.2	38.6
45-64 years	34.6 (2.6)	35.8	34.9	35.6
65 years and over	22.5 (2.9)	23.4	22.5	23.2
	Percent with limitation in major activity			
All Ages	10.8 (.15)	10.6	11.2	10.4
Under 17 years	1.9 (.10)	1.9	1.9	1.9
17-44 years	5.5 (.14)	5.2	5.3	5.2
45-64 years	19.1 (.34)	18.0	19.0	18.1
65 years and over	39.4 (.59)	38.7	39.4	38.9

[1]Income-Region-Color [2]Age-Sex-Color [3]Standard errors

Table 8. Ratio Adjusted Estimates of the Number of Restricted Activity Days Associated with Acute Conditions Per 100 Persons Per Year by Region: United States, 1976

Condition and Region	Total Population	Telephone Population	Telephone Adjusted by IRC[1]	Telephone Adjusted by ASC[2]
All Acute Conditions				
All Regions	957 (17)[3]	934	947	934
Northeast	883 (31)	853	856	851
North Central	884 (29)	873	883	874
South	913 (27)	881	898	881
West	1,234 (42)	1,215	1,241	1,221
Infective and Parasitic Diseases				
All Regions	98 (5)	99	99	99
Northeast	110 (10)	113	113	113
North Central	77 (9)	79	79	80
South	113 (10)	114	114	115
West	87 (10)	84	85	85
Respiratory Conditions				
All Regions	448 (11)	442	447	443
Northeast	409 (20)	395	395	395
North Central	454 (21)	448	452	449
South	387 (18)	381	390	381
West	599 (29)	594	606	598

[1]Income-Region-Color [2]Age-Sex-Color [3]Standard errors