

*Direct sampling to determine rates of health care is not always possible because of inadequate or unobtainable time, personnel or money. A simple method based on national figures is offered. A spot survey of a random sample of a semirural area demonstrated the validity of the procedure.*

## **HEALTH SERVICE UTILIZATION IN CENTRAL VIRGINIA: A COMPARISON OF ESTIMATED AND OBSERVED RATES**

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### **Introduction**

**B**EFORE plans are instituted to improve medical services, a community first needs to obtain information on its health care utilization, regardless of whether it plans to recruit more physicians into the area, open a neighborhood health clinic, or operate existing services more effectively. Most evaluation methods require knowledge of baseline statistics to calculate increments of change, once health services are improved or implemented. However, surveys are costly and not all communities have sufficient resources or expertise to gather these data. Furthermore, this would not be necessary if other reasonably reliable methods were available.

The United States Public Health Service National Health Survey statistics<sup>1</sup> provide information on utilization of health care services. Using these data and correcting for age, sex, race, income, and geographic area, an estimate of health care demands can be derived. To test the validity of this method, a semi-rural area of central Virginia was chosen for a spot survey. The close correlation between observed and derived data supports the concept that an esti-

mate based on national figures and corrected for local demographic characteristics may provide a reasonable alternative to the direct survey method.

### **Methods and Materials**

#### ***Target Community***

The chosen area of Madison County, Virginia, lies in the upper Piedmont plateau with the Blue Ridge Mountains at its western border. It is 327 square miles in area and is 30 miles northeast of Charlottesville, Virginia, where the University of Virginia Medical Center is located. Agriculture is the principal industry, but manufacturing employment has increased within the past decade, especially as a result of many wood product industries. The estimated population is 8,768 as of July 1, 1968, an increase of 7.1 per cent since 1960.<sup>2</sup> The white, nonwhite racial breakdown is 77.6 per cent and 22.4 per cent, respectively.

The town of Madison is the county seat and serves as the major shopping and service center in the county. Almost bisecting the county is a four-lane state highway connecting Charlottesville with Culpeper, the next city beyond

Madison to the north. At the time of the survey, the county had three general practitioners, one of whom subsequently retired. Well-child clinics are conducted twice monthly at the local health department. Within less than ten miles of the county borders, there are 17 other family practitioners. It was felt that this county was typical of the contiguous counties in this area of Virginia in economic and social structure.

### Subjects

Subjects were drawn from the population of the residents of Madison County. Data were obtained for all members of selected households which were chosen in the following manner. From a chosen starting point, the surveyor worked his way through the road system of the county, selecting every tenth house for interview. The 10 per cent designated sample included 219 households with 192 responding, or a rate of 87.5 per cent. However, the actual sample of 702 individuals represents only 8.0 per cent of the total county population.

### Method of Obtaining Data

An individual who had previously worked as a census taker, conducted structured interviews using two questionnaires—one for general information about the household and the other for information on each member of the household. Only persons 16 years or over were interviewed, and the information was obtained about themselves and their children, as well as about adults who were absent at the time of interview. Questions were asked about doctor visits in the prior two weeks. Telephone visits were excluded since the specific information sought from those sampled was direct doctor visitations in the office, clinic, home, or hospital.

### Calculations and Corrections

The following corrections were made to compute yearly rates and to compensate for seasonal variation and demographic differentials between Madison County and the United States.

A. To correct observed Madison County data for yearly rate per person and for seasonal adjustment:

- Actual number of physician visits  
in two-week period, summer 1968  
Number of persons in survey  $\times 26 =$   
doctor visits per person per year
- To correct for seasonal variation in visits:  
Average number of physician visits in  
U. S./person/year  
Average number of physician visits/  
person/3rd quarter  $=$   
 $\frac{4.3}{4.0} = 1.08 =$  seasonal correction factor

B. To standardize National Health Survey data for characteristics of Madison County, which has a 40 per cent farm population and 60 per cent non-farm, nonstandard metropolitan statistical area:

- $x =$  number of doctor visits/person/year in nonfarm, non-SMSA, 1963-1964.  
 $y =$  number of doctor visits/person/year in farm area, 1963-1964.
- 1967 data reveal visit rate only 95 per cent of that in 1963-1964 for a correction factor of 0.95.
- National Health Survey data include telephone calls which account for 10.6 per cent of all visits providing a correction factor of 0.894 to standardize to that of the Madison County area. This varies with age from 21.6 per cent in those below 5 years to a low of 7.7 per cent in the 35 to 44 year age group and will be represented at  $T_{(1-4)}$ ,  $T_{(5-14)}$ ,  $T_{(15-24)}$ , and so on, for various ages of  $T_{(x)}$  for the entire population.

Thus:  $(0.95)(0.4y + 0.6x) =$  doctor visit rate/year for 40 per cent farm, 60 per cent non-farm, non-SMSA, for all ages for 1967 rates.

Final standard formula:  $(0.95)(T_x)(0.4y + 0.6x) =$  doctor visit rate/person/year for same area excluding telephone calls for specific ages (x).

**Table 1—Comparison of Madison population and sample by percentage,\* Madison County, Virginia, 1968**

Years	Madison County population		Sample	
	No.	%	No.	%
0-4	973	11.1	59	8.4
5-14	1,798	20.5	152	21.7
15-24	1,289	14.7	104	14.8
25-34	973	11.1	79	11.3
35-44	973	11.1	72	10.2
45-54	1,026	11.7	72	10.2
55-64	763	8.7	95	13.5
65 and over	973	11.1	69	9.8
Total	8,768	100.0	702	99.9

Chi-square = 24.0354

C. Further, to correct rates from National Health Survey data for any characteristic for a 40 per cent farm area:

3.3 = Over-all visit/person/year for farm area, 1963-1964.

4.3 = Over-all visit/person/year for nonfarm, non-SMSA, 1963-1964.

4.8 = Over-all visit/person/year for all SMSA, 1963-1964.

4.5 = Over-all visit/person/year for all U. S., 1963-1964.

$\frac{(0.4)(3.3) + (0.6)(4.3)}{4.5} = 0.87 = \text{correction factor}$

for rurality and since 1967 rates are 95 per cent of 1963-1964 rates:

0.95 = correction factor for year;

and to eliminate telephone calls,

0.894 = correction factor for telephone;

and an over-all correction factor of:

$0.87 \times 0.95 \times 0.894 = 0.74$

## Results

A comparison of the sample with the entire population of Madison County is shown in Table 1. Statistical analysis done on the age distribution of both reveals a chi square of 24.0 indicating they are significantly different ( $p < 0.005$ ). A closer look at the table reveals that this difference is due to the larger number of 55-64 year olds in the

sample and a smaller number of those in the 0-4 age bracket. The race comparison in Table 2 demonstrates 2.5 per cent more white persons in the sample than are in the entire population.

When the number of physician visits per person per year is compared by age, it is evident that the rates for the Madison County population are quite similar to the United States rates corrected for characteristics similar to Madison (Table 3). This is particularly notable when telephone call visits are excluded from the National Health Survey data. In Madison County the average number of physician visits per person per year for all ages equaled 3.5 compared to 3.3 for all ages in the

**Table 2—Race comparison of population and sample, Madison County, Virginia, 1968**

	Madison population		Sample	
	No.	%	No.	%
White	6,804	77.6	569	81.1
Negro	1,964	22.4	133	18.9
Total	8,768	100.0	702	100.0

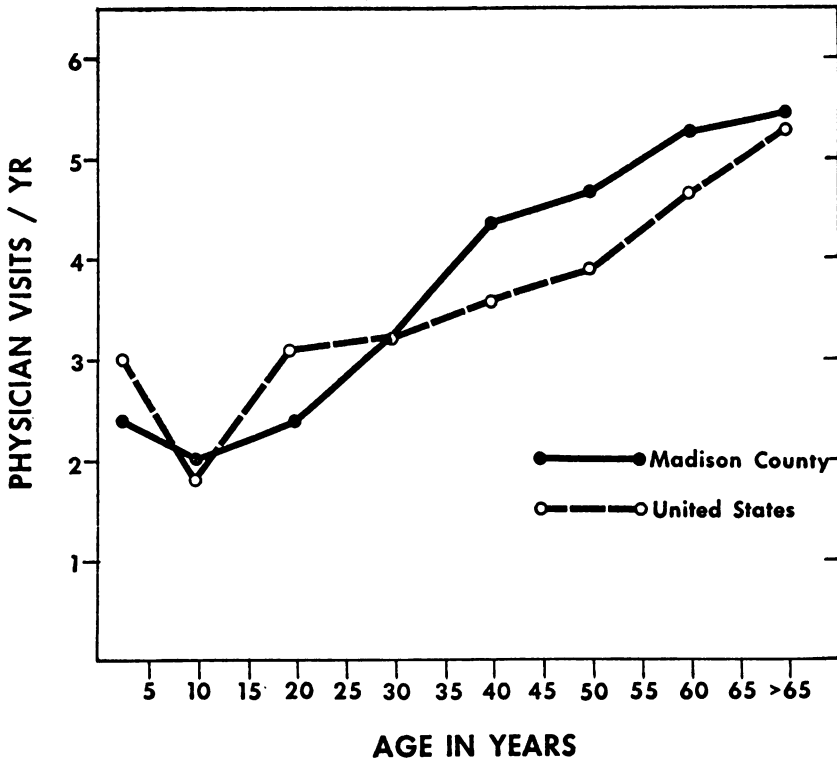
**Table 3—Physician visits per person per year by age, comparison of direct and derived data, Madison County, Virginia, 1968, and United States, 1963-1964**

Years	National Health Survey, 1963-1964			Madison County, 1968
	Farm	Nonfarm	Corrected†	Corrected*
All ages	3.3	4.3	3.3	3.5
0-4	3.6	4.7	3.0	2.4
5-14	1.8	2.5	1.8	2.0
15-24	2.7	4.2	3.1	2.4
25-34	3.0	4.1	3.2	3.2
35-44	2.7	4.4	3.3	4.4
45-54	4.0	4.7	3.9	4.7
55-64	5.6	4.9	4.7	5.3
65+	5.6	6.3	5.3	5.5

\* Corrected for season.

† Corrected for 40 per cent rurality, 1967 rates, and excluding phone calls.

Figure 1—Physician visits per person per year by age, Madison County, Virginia, 1968, and United States 40 per cent farm, 1967



United States. Figure 1 demonstrates this graphically, showing similarity of the trend that increases from 2.4 visits per person per year in the youngest age group to 5.5 in the group over 65. Again, the directly observed rates by race and sex and those derived from the National Health Survey are comparable as seen in Table 4. As expected, females and white individuals exceeded males and nonwhites in their quest for medical care.

When physician visits are analyzed by educational level of household head, the lowest utilizers are those with the least education, or 2 visits per person per year for those with less than five years of schooling versus 4.8 visits for

Table 4—Physician visits per person per year by sex and race, Madison County, Virginia, 1968, and United States, 1963-1964

	Madison*	United States	United States†
<b>Sex</b>			
Male	3.0	4.0	3.0
Female	4.1	5.1	3.8
<b>Race</b>			
White	3.7	4.7	3.5
Nonwhite	2.9	3.3	2.9
<b>Total</b>	<b>3.5</b>	<b>4.5</b>	<b>3.3</b>

\* Corrected for season.

† Corrected for 40 per cent rurality, 1967 rates, and excluding phone calls.

**Table 5—Physician visits per person per year by education of head of household, Madison County, Virginia, 1968, and United States, 1963-1964**

Years of education	Madison*	United States	United States†
<5	2.0	4.0	3.0
5-8	3.5	4.2	3.1
9-12	3.2	4.4	3.2
13+	4.8	5.4	4.0
Unknown	4.5	4.2	3.1
All persons	3.5	4.5	3.3

\* Corrected for season.

† Corrected for 40 per cent rurality, 1967 rates, and excluding phone calls.

those of college level. This compares reasonably well with data from the National Health Survey in Table 5.

In answer to questions regarding doctor availability in the area, 14.5 per cent of the sample said there had been occasions when they would have liked to see the doctor but were unable to do so. Over half of these felt that this was definitely related to unavailability of the physicians. Thirty-nine per cent of all the household representatives who answered placed sufficient value on doctor availability to pay a greater fee for assured coverage. The cost of doctor visits in that area, excluding laboratory services, ranged between 0 and \$9; but the majority, or 82 per cent, paid between \$4 and \$5 for each visit.

An incidental finding seen in Table 6 was the variation between the location they thought they used for primary care and the place actually utilized within the prior two weeks. These are designated "alleged" and "actual" locations on the table. Over half, or 56 per cent, of persons claimed to use the town of Madison, which is the most central location in the county, and a diminishing number claimed seeking care in more distant areas. Nevertheless, only 35 per cent of persons had actually utilized doctors in the town of Madison

in the prior two weeks. The major difference was made up by those going to the farthest distance, i.e., 30 miles to Charlottesville which serves as the medical hub of the area.

## Discussion

Statistics on health service utilization obtained by direct survey provide information a great deal closer to reality than information derived from an overall figure. Often, however, the time and expense preclude undertaking a direct survey, or limited manpower ability and resources compromise the validity of such a survey. As in this study, statistically significant differences in age distribution can occur even when great care is taken to select a representative sample. Nevertheless, community leaders and health planners often need information—even theoretical information—to alter policy or to make decisions with regard to provision of services. An alternative, that of using derived data, should be seriously considered, especially in a small community.

The rate of health service utilization is a complex phenomenon and should not be confused with the need for medical care. Rather it is a function of attitudes and behavior toward seeking care, as well as availability of services. In-

**Table 6—Percentage distribution of alleged location and actual location of medical care within past month, Madison County, Virginia, 1968**

	Alleged location %	Actual location %
Madison, Virginia	56	35
Orange, Virginia	17	17
Brightwood, Virginia	13	13
Sperryville, Virginia	6	4
Culpeper, Virginia	4	7
Charlottesville, Virginia	3	21
Gordonsville, Virginia	1	3

cluded among these are economic factors, accessibility of resources, energy, enthusiasm, and planning efforts, health knowledge, ability to recognize symptoms, cultural background, and the like.<sup>3</sup> This study shows a close similarity between information on doctor visits obtained by the direct method and those derived from national figures. At the time of the survey, three family doctors were available to the people of Madison. Assuming that 69 per cent of the medical care sought was in that county (Madison and Brightwood), these three practitioners would need to serve approximately 28 patients per day, based on a 250-day working year. On the other hand, if only 49 per cent utilized the three local doctors, as was claimed for the two weeks prior to the survey (Table 6), each would average only 18 or 19 patients per day. The real figure probably lies somewhere between these extremes, as most general practitioners in this area handle between 20 and 25 visits per day.<sup>4</sup> Had the providers of service been fewer or entirely absent, the survey results might have been well below national figures. In accepting derived data in lieu of direct observation, it is evident that some source of medical care must be convenient to the population in question.

A somewhat unexpected finding of a slightly higher utilization rate in this area was interesting and opposite to expectation. The sample contains a higher percentage of whites and of people in the age group over 55 years than that found in the Madison population. The higher health utilization rates for these groups, coupled with a greater number of doctor visits per person per year among the 35 to 54 year olds in the

sample, probably account for this difference.

To apply the formula included in the previous section of this article (Results) to any area, one has only to determine the percentage rurality and nonrurality, non-Standard Metropolitan Statistical Area, and to make the appropriate correction for these. Until more recent rates become available, the corrections, to bring them up to 1967 rates, and exclusion of telephone calls, can be those used in this paper.

### Summary

A simple method for estimating rates of health care utilization based on national figures is outlined. This method is proposed as an alternative to direct sampling when time, personnel, or funds preclude such a survey. A spot survey done on a random sample of one semirural area in central Virginia demonstrated the validity of this procedure. Caution must be exercised in accepting these derived estimates unless there is assurance of a source of medical care within reasonable distance of the community in question.

### REFERENCES

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