

## ALTERNATIVE OPTIONS FOR ENHANCING THE REPRESENTATION OF RURAL AREAS IN THE NMES

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### 1. INTRODUCTION

Health care data at the national level support the formulation of national health policies. On another level, the need for reliable estimates that characterize the health care needs and experience of individuals residing in rural areas has been rapidly gaining recognition. This increased attention to rural health care needs has been stimulated by a growing concern with issues of access to care. Indeed, some initiatives have been directed at improving the health care experience of rural populations that are more likely to be poorer, older, and less well insured than their urban counterparts. With this focus, the National Advisory Committee on Rural Health has been chartered by the Department of Health and Human Services to recommend improved access to health care services for rural residents. Committee recommendations also call for expanding the Department's minority initiative to include specific initiatives that target rural minority populations.<sup>1</sup> Furthermore, the Committee's future agenda calls for an analysis of the potential impact on rural areas of national proposals to expand health insurance coverage for the uninsured and to reform the Medicaid program. In a related focus, the Office of Rural Health Policy within the Health Resources and Services Administration is charged with examining the effects that Medicare and Medicaid programs have on access to health care by the rural population.<sup>2</sup>

One of the general recommendations of the National Advisory Committee on Rural Health in 1990 to the Department of Health and Human Services was to increase the quantity and quality of rural health research. Secretary Louis Sullivan cited new impetus being given to rural mental health research through the creation of an office of Rural Mental Health within the National Institute of Mental Health and the establishment of two exploratory research centers to study rural elderly populations by the National Institute on Aging.<sup>3</sup> In a related development, there was a significant increment in the funds committed by the Agency for Health Care Policy and Research (AHCPR) between FY 1989 and FY 1990 for extramural research activities directed to rural health research.<sup>3</sup> Over the same period, additional funds were allocated to AHCPR intramural research efforts and to program activities of AHCPR's User Liaison Program directed toward rural health research.

The health care data collected in the 1987 National Medical Expenditure Survey (NMES II) provide a rich source of information to support analyses assessing the health care experience of individuals residing in rural areas of the nation.<sup>4,5</sup> More specifically, the Household Component of NMES II was established to provide an assessment of the health care utilization, expenditures, sources of payment and health insurance coverage of the U.S. civilian noninstitutional population. The period of assessment covers calendar year 1987, during which data were collected from a national probability sample of dwelling units. The survey was designed to provide data for a major research effort in the Center for General Health Services Intramural Research of the Agency for Health Care Policy and Research. The NMES II household survey was a year long panel, which collected measures of health status, use of health care services, expenditures and sources of payment, insurance coverage, employment, income and assets, and demographic information

for calendar year 1987. It is important to note that the sample design of the NMES II had no special provisions to enhance the representation of households located in rural areas.

This report reviews alternative definitions of rural areas and describes the classification scheme considered for the 1996 NMES III. In addition, it provides a summary of the NMES II sample design and a review of the NMES II sample representation in rural areas. This report also provides a summary of the analytical capabilities and limitations of the current design with respect to yielding reliable estimates of health care parameters for rural areas of the nation.

### 2. DEFINITION OF RURAL AREAS

Although the concepts of "rural" and "urban" exist as part of a continuum, primarily ordered on the dimensions of population size and residential population density, Federal policies and programs often consider discrete classification schemes. Despite the limitations of a dichotomous classification scheme that can mask important variations within urban and rural areas, many Federal policies use this approach. More specifically, a dichotomous rural/urban classification scheme is used to certify health facilities under the Rural Health Clinics Act, and to categorize hospitals as urban or rural for purposes of hospital reimbursement under Medicare.<sup>6</sup> Alternative classification schemes are often considered, however, depending on the appropriateness of the respective typology for the purpose under consideration.

Two of the most widely used classification schemes considered for Federal program administration or distribution of funds are the urban/rural definitions specified by the Bureau of the Census and by the Office of Management and Budget (OMB). Areas designated as urban by the Census definition include "urbanized areas" consisting of a central city (or cities) and adjacent territory outside the city's political boundaries that have a combined population of at least 50,000. Other areas designated as urban consist of places with 2,500 or more residents living outside of urbanized areas.<sup>7</sup> According to the Census definition, all remaining areas not classified as urban are designated as rural areas. Since the boundaries of Census urban and urbanized area designations are a function of settlement size and density, they can cross county and/or State lines.<sup>8</sup>

Alternatively, counties are the elemental units of OMB's Metropolitan Statistical Area (MSA) designation. One or more counties (cities or towns in New England) define an MSA based on their population size, density, and their level of economic integration. More specifically, the following standards were adopted for classifying an area as an MSA based on 1980 Census data: the MSA must include a city with 50,000 or more residents, or the MSA must include an urbanized area that is part of a county or counties with a population of at least 100,000 individuals.<sup>9,10</sup> When a dichotomous rural/urban classification scheme is considered according to the OMB designation, rural areas are all counties with a nonmetropolitan classification.

There is significant variation between the Census defined urban/rural areas and the OMB designated metropolitan/nonmetropolitan areas. A Census defined urbanized area typically covers less area than an MSA, which is composed of whole counties, although it does include the built-up area at

the core of the MSA. In 1980, 40 percent of the Census defined rural population lived in MSAs, and 14 percent of the MSA population lived in Census defined rural areas.<sup>6</sup> In 1989, it was estimated that 46 percent of the Census defined rural population lived in metropolitan areas, and 16 percent of the MSA population resided in Census defined rural areas.<sup>11</sup>

The availability of data and the ease of classification with existing data sources often determine which definition of "rural" will be employed for particular studies or for the purposes of Federal program administration and funds distribution. Often, metropolitan or nonmetropolitan status is the only classification of urban or rural available to analysts of national health care survey data.

The 1983 report on the "Status of the Rural Elderly," prepared by the Task force of the Rural Elderly of the House of Representatives' Select Committee on Aging, provides an excellent example of the difficulties encountered in determining an operational definition of the rural population.<sup>12</sup> The report indicated that the lack of a consistent definition of the "rural" population is the most serious dilemma in conducting and interpreting research directed towards this population. Defining rural areas as those outside MSAs was found to be administratively clear and precise. However, such a definition of "rural" results both in the inclusion of considerable population that has been characterized as "urban" according to alternative definitions and in the exclusion of populations identified as "rural" based on these alternative definitions. When examining the health status and needs of the rural elderly, or rural populations in general, alternative definitions of the rural population yielded different findings.

In order to evaluate the precision of the estimates for rural areas based on NMES II data, and to consider alternative sample designs that would increase the precision for such areas in future surveys, it is necessary to adopt a standard definition of what constitutes a rural area. The urban/rural classification scheme considered for the purposes of this evaluation must satisfy the following requirements:

1. Has been used as an official standard for the purposes of Federal program administration or distribution of funds;
2. Has particular advantages for the purposes of health services planning and research; and
3. Can be easily implemented for purposes of increasing the sample size of individuals residing in rural areas.

Alternative rural typologies have particular merit, depending on the specific purpose of their implementation. The benefits of nine alternative county-based typologies used to describe nonmetropolitan areas for the purposes of quantifying rural health problems and needs are described in Hewitt.<sup>6</sup> In the absence of a standard rural typology, however, it is difficult to recommend a single set of sample design modifications that will enhance the sample representation of rural areas in the 1996 National Medical Expenditure Survey.

In determining which rural typology to consider as a standard, a county-based rural/urban classification scheme would have particular advantages with respect to improving the analysis of health care data for rural areas. Because of their stable boundaries, the availability of Census data on their population characteristics, and their importance as health administrative units, counties are particularly important units for purposes of health services planning and research. Furthermore, consideration of a county-based classification scheme would facilitate an expansion of available health data for analytical purposes through linkage to the Area Resource

File (ARF), a county level database maintained by the Health Resources and Services Administration.<sup>13</sup> The ARF contains population, economic and mortality data and information on hospital resources and the supply of health personnel.

Since the OMB metropolitan/nonmetropolitan designation for an area uses counties as the building blocks, whereas the Census rural/urban typology is somewhat more complex, the general OMB approach has been selected as the standard for the NMES II sample design analysis. As a consequence of the analytical limitations inherent in a classification scheme based on the OMB metropolitan/nonmetropolitan designation for an area, the OMB dichotomous classification scheme has been refined to distinguish nonmetropolitan counties by aggregate population size and their proximity to metropolitan counties. The U.S. Department of Agriculture has developed an urban/rural typology which also maintains the county as the geographic unit of classification. This scheme refines the OMB's MSA/nonMSA definitions to reflect a 10-stage continuum from large metropolitan counties that contain core cities to sparsely populated counties with remote communities. Each county in the nation is assigned a code, known as a Beale code, based on its classification as a metro/non-metro area, its population concentration, and its proximity to metro areas (Table 1).<sup>14</sup> Using this 10-stage continuum, rural areas can be more selectively targeted for purposes of oversampling in the next cycle of the NMES.

The General Accounting Office (GAO) of the U.S. Congress has also considered the Beale code continuum to differentiate between rural and non-rural counties. The GAO approach to defining rural areas in the nation excludes nonmetropolitan counties with populations of at least 20,000 urban residents from a rural classification. This typology defines four levels of "rural" by classifying nonmetropolitan counties with urban populations of less than 20,000 on two dimensions.<sup>14</sup> One dimension considers aggregate size of the urban population and the other considers proximity to metropolitan counties. Rural counties are distinguished as either having 2,500 to 19,999 urban residents (counties with Beale codes of 6 or 7) or having no places of 2,500 or more population (counties with Beale codes of 8 - 9). Proximity is defined by shared boundaries with an MSA and a pattern of commuting to the MSA at a level of at least two percent. About 16 percent of the 1984 population lived in such counties.<sup>14</sup> The GAO designation of rural areas was adopted for this report.

Because the Area Resource File (ARF) consolidates many data elements useful in analysis of health issues at the county level, it was used in this report as the primary source of data on the 1980 Census populations and population densities of the counties and for the 1980 Human Resource Profile County Adjacency Codes. The codes are defined identically to the Beale codes, based on 1980 data, and will be referred to as Beale codes in this report to avoid confusion. The ARF county file consists of information for 3,080 U.S. counties as compared to the 3,096 counties classified by the Economic Research Service of USDA in Table 1. These discrepancies occur because of differing strategies for classifying independent cities in Virginia and the boroughs and census areas in Alaska. The ARF treatment of five independent cities in Virginia as county equivalents does not affect the classification of rural counties. However, the treatment of Alaska as one entity with a Beale code of "3" (Metropolitan county with less than 250,000 residents) is not appropriate for analysis that focuses on rural populations. Thus, all tables relating to counties and their populations in this report

represent the additional Alaska boroughs and census areas, in their appropriate Beale code groups and with their actual frontier status as ascertained from USDA and Census documents, combined with the counties contained in the ARF.

In summary, there are several different approaches to defining rural now in use. For the purposes of this report we have employed the GAO specification to define rural areas. This classification was most effective in developing estimates of sample size for different approaches to oversampling the rural population.

### 3. NMES II SAMPLE REPRESENTATION IN RURAL AREAS

In this evaluation of NMES II sample representation in rural areas, the Beale codes are used to differentiate rural and nonrural counties. Counties with Beale code values of 0, 1, 2, or 3 are defined as metropolitan and are part of Metropolitan Statistical Areas (see Table 1). For this investigation, all such metropolitan counties are combined into a single category identified as "Metropolitan." Counties with Beale codes of 4 or 5 are defined as nonmetropolitan counties with an urban population of at least 20,000 individuals. Counties with these Beale codes are combined into a single category identified as "Urban NonMetropolitan." All remaining counties with Beale codes of 6, 7, 8, or 9 are considered to be rural counties. For this investigation, these rural counties are divided into two categories based on population size. Rural counties with Beale codes of 6 or 7, which indicate an urban population size between 2,500 to 19,999, are combined into a single category identified as "Rural/2,500+." The remaining rural counties, with Beale codes of 8 or 9 indicating no place of 2,500 or more population, are combined into a single category identified as "Rural/<2,500."

Table 2 presents a distribution of all counties in the nation using the grouped Beale code classification scheme to distinguish urban and rural areas based on 1980 population data. This county level distribution by Beale code groupings is further classified by Census Region and Division to provide a more comprehensive overview of the geographic dispersion of rural counties across the nation. The data indicate that over two-thirds of the counties in the nation are rural.

A distribution of the 1980 U.S. population according to Beale code groupings and Census Region and Division is presented in Table 3. The 2,098 rural counties contained only 16 percent of the total U.S. population. The heaviest rural county and population concentrations were in the Midwest and South regions, while the smallest rural county and population concentration was found in the Northeast region.

Within this framework, the representation of the NMES II sample in rural areas is evaluated in terms of both resultant sample size and also the precision achieved for health care estimates derived for rural populations. The NMES II sample consisted of 165 primary sampling units (PSUs) that were defined as counties or groups of contiguous counties. A distribution of the NMES II sample PSUs by Census Region and Beale code groupings is presented in Table 4. When a NMES II PSU consisted of a group of contiguous counties that were characterized by more than one Beale code, the PSU was assigned the dominant Beale code classification based on estimated population size. Since the NMES II sample of PSUs was selected with probabilities proportional to size, it is not surprising to observe that the majority of PSUs (75.8 percent, 125 out of 165) is classified as metropolitan areas. The PSUs representing the 19 largest SMSAs in the nation as of 1980 were selected into the sample with certainty. Of the remaining NMES II sample PSUs, 17

were classified as urban nonmetropolitan areas, and 23 were classified as rural (dominant Beale codes of 6 - 9).

A further classification of the NMES II sampled PSUs by Census Region reveals the greatest sample representation of rural PSUs coming from the Midwest and South Regions, with only a single sample PSU representing rural areas in the Northeast region.

Detailed distributions of all the counties and sampled segments that comprise the NMES II sampled PSUs are presented in Table 5 classified by Beale code classification and Census region. To complete the examination of the NMES II sample representation in rural areas, Table 6 provides a corresponding distribution of all responding sampled dwelling units and sample participants. Overall, the NMES II sample consists of 13,015 sampled dwelling units which contain 34,459 sampled participants responding for their entire period of eligibility in 1987 as members of the civilian non-institutionalized population (NMES II full year respondents). Approximately 16 percent of the responding sample were selected from rural counties of the nation. Within the Northeast and West regions of the nation, the sparseness of the rural sample representation at the person and dwelling unit levels is evident. For example, only 215 sample respondents were selected to represent rural areas in the Northeast census region.

Having described the level of NMES II sample representation in rural areas of the nation, the report now shifts its focus to an evaluation of the reliability of NMES II survey estimates for characterizing the health care experience of individuals residing in these areas. In NMES II, strict precision requirements were specified for the survey design in order to ensure that analytical objectives would be achieved. More specifically, explicit precision levels were specified for key survey statistics that characterized the nation in addition to the following policy relevant population subgroups: blacks, Hispanics, the elderly, the poor and near poor, and the functionally impaired. The statistics of interest included the following measures of health care utilization and expenditures per individual:<sup>4</sup>

1. Mean number of ambulatory medical care provider contacts,
2. Mean expenditures for ambulatory medical care provider contacts,
3. Mean number of dental visits,
4. Mean expenditures for dental visits,
5. Mean number of prescribed medicines,
6. Mean expenditures for prescribed medicines,
7. Mean number of hospital stays, and
8. Mean expenditures for hospital stays.

For computational convenience, the precision criteria for NMES II survey estimates were expressed in terms of **relative standard errors**, rather than variances.

In NMES II, the survey design was required to achieve an average relative standard error of .02 for overall population estimates of the utilization and expenditure measures of ambulatory medical provider contacts, dental visits, and prescribed medicines. A relative standard error specification of .03 was specified for overall population estimates of mean expenditures for hospital stays, since there is greater variability in the population for this measure. For many of the subgroups of interest, a relative standard error of .05 was the desired level of precision for survey estimates.

Table 7 provides a summary of preliminary health care utilization and expenditure estimates for the measures under consideration that are derived from NMES II. The table also

includes a summary of the precision of the survey estimates achieved by the NMES II survey design. Note that the relative standard errors generally converged around the precision requirement of .02 for the key survey estimates of interest. Furthermore, the NMES II survey design approached the desired relative standard error specification of approximately .03 for the mean estimate of medical expenditures for hospitalizations for the overall population.

Table 7 also provides a summary of the precision levels that were achieved in NMES II for survey estimates that characterize rural areas of the nation. To enhance this evaluation of the analytical capacity of the NMES II to derive reliable health care estimates for individuals residing in rural areas of the nation, we consider both the overall classification of rural (as defined by counties with Beale codes of 6 through 9) and an additional distinction that further separates rural counties with no places of 2,500 or more population.

When examining the precision of the NMES II survey estimates that characterize the rural population of the nation based on the more inclusive definition of rural areas, it is noted that the NMES II sample provides a strong analytical capacity for analyzing the health care experience for this target population. The overall average relative standard error for survey estimates of the utilization and expenditure measures under consideration for the rural population was approximately .05 (.052). As noted, a relative standard error of .05 was the desired level of precision for NMES II survey estimates that characterized many of the policy relevant population subgroups of interest. A more careful examination of the NMES II sample representation in rural areas reveals a rich overall sample of 5,432 survey participants, associated with 2,030 sampled dwelling units, located in 329 sampled segments within 23 sampled PSUs (Tables 4-6).

The survey design limitations are more evident when examining the precision of the NMES II survey estimates for the rural population of the nation residing in rural counties with no places of 2,500 or more population. The overall average relative standard error for the NMES II survey estimates under consideration for this population residing in rural counties with populations below 2,500 individuals was approximately .10 (.102, Table 6). The NMES II sample representation in these sparsely populated rural areas consists of only 901 full year survey participants, associated with 343 sampled dwelling units, located in 62 sampled segments within 4 sampled PSUs (Tables 4-6). If a population subgroup of interest included 20 percent of this portion of the NMES II rural sample, it is estimated that the average relative standard error in survey estimates would be greater than .225, based on a sample of only 181 individuals. As a consequence of the small sample size of individuals residing in counties with Beale code classifications of 8 or 9, NMES II estimates for such population subgroups would be highly variable.

When examining the capacity to derive NMES II health care estimates for rural areas within specific Census regions, it is evident that the sparse sample representation in the Northeast region (consisting of 215 individuals, with the selection of only 1 primary sampling unit with a dominant county classification of rural) will not support the production of reliable estimates. In addition, the limited sample representation in the West region, both at the primary sampling unit and person levels, restricts the ability to conduct population subgroup analyses. The NMES II sample does allow for more expansive analyses of individuals residing in the South and Midwest regions. However, the capacity to derive separate health care estimates that characterize only a

portion of the Census regions is analytically unappealing, since many of the policy driven analyses demand a capacity for comparisons across all regions of the nation.

#### **4. ALTERNATIVE OPTIONS FOR ACHIEVING ESTIMATES WITH HIGHER PRECISION FOR RURAL AREAS IN THE 1996 NATIONAL MEDICAL EXPENDITURE SURVEY (NMES III)**

The NMES II sample design had no special provisions to increase the sample selection of households located in rural areas. However, under a general definition of "rural" that includes counties with Beale codes greater than 5, the NMES II data will provide estimates of the "rural" population that achieve reasonable precision. When the analytical focus is shifted to a subset of this population, e.g., counties with Beale codes of 8 or 9, the sample sizes are generally too small to yield reliable estimates of health care parameters for rural areas. Sample size limitations also preclude further geographical distinctions of rural areas within specific Census regions such as the Northeast.

Having summarized the analytical capabilities and limitations of the current NMES II design with respect to yielding reliable estimates of health care parameters for rural areas of the nation, we can now specify a range of alternative designs that would yield estimates of greater precision for rural areas from the 1996 NMES III. The strategy for developing this set of alternative designs is to build upon the NMES II design without any loss in precision for the overall sample or any of the population subgroups targeted for oversampling in NMES II. To ensure this design requirement is achieved, all the alternative design options that are proposed consider sample augmentation without any offsetting sample reduction.

Each of the options under consideration is designed to obtain estimates of acceptable precision for the four Census regions of the nation or for different portions of the rural population or both. In order to operationalize this process, the following framework was adopted:

1. A formal design objective was specified for each option under consideration.
2. An explicit precision requirement was specified for survey estimates.
3. The required level of sample augmentation necessary to achieve the design objective and to satisfy precision requirements was determined and described in detail. Consequently, explicit sample size requirements at each stage of selection are provided.

The general sample design for the NMES II is retained with modifications proposed to achieve increases in sample sizes for rural areas. For the NMES II the total sampled units were 165 primary sampling units representing 127 distinct areas; 2,290 segments; and 13,015 responding dwelling units. Overall, the average number of responding dwelling units per primary sampling unit was 78.88 (13,015/165) for the entire sample and 88.26 (2030/23) for rural areas. The average number of responding dwelling units per segment was 5.68 for the entire sample and 6.17 (2030/329) for rural areas. In addition, the average number of responding individuals per dwelling unit was 2.65 for the entire sample and 2.676 (5432/2030) for rural areas.

The following sample allocation scheme was used for all proposed sample expansions in rural areas, consistent with the sample allocation scheme found in NMES II:

1. An average of 79 responding dwelling units will be obtained from each additional primary sampling unit sampled from rural areas. Since the expected overall

occupancy rate for NMES II was 88 percent and the overall response rate for NMES II was 80 percent, it will be necessary to sample 112 addresses per primary sampling unit to obtain 79 responding dwelling units ( $78.8 = 112 \times .88 \times .80$ )

2. An average of six responding dwelling units will be obtained from each additional segment selected from rural areas. Since the overall occupancy rate for NMES II was 88 percent and the overall response rate for NMES II was 80 percent, it will be necessary to sample 9 addresses per segment to obtain 6 responding dwelling units per segment ( $6 = 9 \times .88 \times .80$ ). Furthermore, for estimating data collection costs, it will be necessary to assume that there will be 1.07 separate reporting units per dwelling unit. Consequently, for each 100 responding dwelling units, interviews will be conducted for the 107 distinct reporting units associated with these dwelling units.
3. An average of 13 segments will need to be selected per primary sampling unit to obtain approximately 79 responding dwelling units ( $78 = 13 \text{ segments} \times 6 \text{ responding dwelling units per segment}$ ).
4. Primary sampling units are defined as counties. Segments are defined as Census enumeration districts or block groups.

Within this framework, four alternative sample design enhancements are proposed to facilitate the development of a more complete rural database as part of the 1996 NMES III. The first option considers a sample design expansion to facilitate the derivation of reliable health care estimates for rural areas within each Census region. Under this scenario, the more inclusive definition of rural areas is adopted, which includes all counties with Beale codes of 6-9. The second option allows for separate estimates for those rural areas consisting of rural counties with an urban population of between 2,500 and 19,999 individuals (Beale codes 6-7), and for the more sparsely populated rural areas (counties with Beale codes 8-9). However, it does not guarantee a capability for producing reliable estimates of rural areas by Census region. The third option also ensures a capacity to derive reliable health care estimates separately for the two distinct types of rural areas. In addition, this alternative will yield reliable estimates for rural areas within each Census region. The fourth option is a stand alone sample design enhancement that can be added to any of the first three options to improve the precision of survey estimates that characterize individuals residing in rural frontier counties of the nation. A rural frontier county is defined here as a county with a Beale code classification of 6-9 and a population density of less than 6 persons per square mile.

#### 5. ALTERNATIVE OPTIONS FOR ACHIEVING ESTIMATES WITH HIGHER PRECISION FOR RURAL AREAS IN THE 1996 NATIONAL MEDICAL EXPENDITURE SURVEY (NMES III)

##### **OPTION A: Yield Reliable Health Care Estimates for Rural Areas for each Census Region - Rural Areas Defined With Beale codes 6-9**

This option builds upon the NMES II design with a sample expansion to facilitate the derivation reliable health care estimates for rural areas within each Census region. The more inclusive definition of rural areas is adopted for this option, which includes all counties with Beale codes of 6-9. Since many of the policy driven analyses using NMES II data demand a capacity for comparisons between regional

estimates, a sample expansion to permit this capability for health care estimates for rural areas is analytically desirable.

To ensure the derivation of precise regional estimates of the health care utilization and expenditure patterns of individuals residing in rural areas, an explicit precision requirement was imposed on the design. For each Census region, the survey design was required to achieve an average relative standard error of .10 for health care estimates of the rural population.

It is immediately evident that rural health care estimates derived for the Midwest and South Census regions will yield levels of precision that surpass the target average relative standard error of .10, based on their sample representation in NMES II. Consequently, no sample additions are necessary for these regions. Overall, the sample will need the following augmentation to meet the desired precision requirement.:

9 PSUs (6 = Northeast, 3 = West) 112 segments, 740 responding dwelling units, (1,052 sampled addresses), and 1980 responding individuals.

##### **OPTION B: Yield Reliable Health Care Estimates for Rural Areas Further Distinguished By Population Size - Separate Estimates for Rural Areas With Beale Codes 6-7 and Beale Codes 8-9**

Option B allows for separate estimates for rural areas consisting of rural counties with urban populations of between 2,500 - 19,999 individuals (Beale codes 6-7), and for the more sparsely populated rural areas (counties with Beale codes 8-9). However, it does not guarantee a capability for producing reliable estimates of rural areas by Census region. Since the concept of "rural" exists as part of a continuum, primarily ordered on the dimensions of population size and residential population density, there is strong analytical interest in comparing the health care experience for these two distinct types of rural populations.

To ensure the derivation of precise estimates of the health care utilization and expenditure patterns of individuals residing in each distinct classification of rural areas, an explicit precision requirement was imposed on the design. For each distinct type of rural area, the survey design was required to achieve an average relative standard error of .05 for health care estimates of the rural population. This is approximately equivalent to the level of precision achieved in the NMES II for the entire rural population, based on the more inclusive definition that grouped counties with Beale codes of 6-9 together.

Overall, the sample will need the following augmentation to meet the desired precision requirement:

33 PSUs (9 with Beale codes of 6-7, 24 with Beale codes of 8-9), 400 segments, 2,394 responding dwelling units, (3,389 sampled addresses), and 6,380 responding individuals.

##### **OPTION C: Yield Reliable Health Care Estimates for Rural Areas Further Distinguished By Population Size and Census Region - Separate Estimates for Rural Areas With Beale Codes 6-7 and Beale Codes 8-9**

Option C also ensures a capability to derive reliable health care estimates separately for the two distinct types of rural areas. In addition, this alternative will yield reliable estimates for rural areas within each Census region. As in Option A, the survey design was required to achieve an average relative standard error of .10 for health care estimates of the rural population within each Census region. The modification

associated with Option C is a separate imposition of this precision requirement for each region for the two distinct types of rural areas under consideration: rural areas with a urban population of between 2,500-19,999 individuals, and rural areas having no places of 2,500 or more population.

The required sample size necessary to satisfy the precision specification has already been presented in Option A. More specifically, it will be necessary to obtain a sample of 7 PSUs and 91 segments, yielding approximately 550 responding dwelling units and 1,469 responding individuals for each combination of Census region, and rural area classification. Table 10 provides a detailed summary of the desired rural sample, at all stages of selection, to satisfy the requirements of Option C. The tables also provide a summary of the NMES II rural sample, and the sample augmentation necessary to achieve the desired sample.

Overall, the sample will need the following augmentation to meet the desired precision requirement:

35 PSUs (11 PSUs with Beale codes of 6-7, 24 PSUs with Beale codes of 8-9), 436 segments, 2,739 responding dwelling units, (3,889 sampled addresses), and 7,398 responding individuals.

#### **OPTION D: Yield Reliable Health Care Estimates for Rural Frontier Areas**

Option D is a sample design enhancement entirely separate from the preceding three options. It can be added to any of the first three options to improve the precision of survey estimates that characterize individuals residing in rural frontier counties of the nation. The National Rural Health Association has advanced a rural area classification scheme that incorporates this frontier concept in distinguishing areas by population density. These frontier counties include some of the most remote areas of the nation, having population densities of fewer than six persons per square mile. Health services are often difficult to provide in these large, sparsely populated areas. Residents of frontier areas may need to travel large distances, with an average travel time in excess of an hour, in order to reach health providers and facilities.<sup>16</sup>

Given the potential difficulties faced by residents of rural frontier areas in obtaining essential medical care, there is a need to examine their access and utilization of health care services in contrast to the experience of residents of more densely populated rural and urban areas. Only by such comparisons can Federal health care programs be more effectively tailored to the communities they are intended to serve.

Restricting our attention to rural frontier counties with Beale codes of 6-9, 389 frontier counties in the nation (Table 11) had a total population of less than 3 million individuals as of 1980 (Table 12). Given the sparse population in these frontier areas, the NMES II does not have a capacity to yield reliable health care estimates for this target population.

Option D will ensure a capacity to derive reliable health care estimates for the population residing in rural frontier counties of the nation. The explicit precision requirement imposed on the design is the realization of an average relative standard error of .10 for health care estimates of the rural population in frontier areas of the nation. Since this specification is consistent with the precision requirement specified in Option A for rural populations in each Census Region, the required sample size necessary to achieve this specification has already been presented. More specifically, it

will be necessary to obtain a sample of 7 Primary Sampling Units and 91 segments, yielding approximately 550 responding dwelling units and 1,469 responding individuals for the overall population residing in rural frontier areas. Table 13 provides a detailed summary of the desired frontier area sample in the 1996 NMES III, at each stage of selection, to satisfy the requirements of Option D. Given the sparse population in these frontier areas, it was assumed that no frontier counties would be selected in a future NMES without the required sample augmentation.

Overall, the sample will need the following augmentation to meet the desired precision requirement:

7 PSUs, 91 segments, 550 responding dwelling units (784 sampled addresses), and 1,469 responding individuals.

#### **6. SUMMARY**

The health care data collected in NMES II provide a rich source of information to support analyses assessing the health care experience of individuals residing in rural areas of the nation. This report provides a summary of the analytical strengths and limitations of the current NMES II sample design with respect to yielding reliable health care estimates for rural areas of the nation; it also proposes options for increasing the reliability of survey estimates for rural areas in the 1996 NMES III. The operational definition of rural areas adopted for this investigation expands upon the OMB metropolitan/non-metropolitan designation, using the 10-stage rural/urban classification scheme developed by the Department of Agriculture. Rural counties are distinguished as either having 2,500 to 19,999 urban residents (counties with Beale codes of 6-7) or having no places with 2,500 or more population (counties with Beale codes of 8-9). When the precision of NMES II survey estimates for the overall rural population was examined, it was determined that the NMES II sample provides a strong analytical capacity for analyzing the health care experience for this target population. The survey design limitations are more evident when attention is directed to NMES II health care estimates for rural areas within specific Census regions, or for the more sparsely populated counties with no places of 2,500 or more population. To improve upon existing design limitations, the report outlines the required sample size enhancements for a range of alternative design modifications that facilitate the development of a more complete rural database as part of the next NMES.

Four alternative sample design enhancements are proposed to improve upon the limitations of the NMES II with respect to yielding reliable health care estimates for rural populations. Option A, would yield reliable estimates within Census regions for rural areas defined by Beale codes 6-9. Option B would allow for separate estimates for rural areas with Beale codes 6-7 and those with Beale codes 8-9 (but not separately by Census region). Option C, the largest of the sample enhancements, would allow separate estimates within Census region for rural areas with Beale code 6-7 and those with Beale codes 8-9. The final option, which can be added to any of the first three options, will allow for reliable survey estimates that characterize individuals residing in rural frontier counties of the nation.

(For copies of the referenced tables and the reference section, please contact Dr. Steven Cohen, Director, DSRM, at (301) 443-4836).