



Methodology Report #33

**Sample Designs of the Medical Expenditure Panel
Survey Household Component, 1996–2006 and
2007–2016**



Abstract

Three sample designs have been used for the MEPS Household Component (MEPS-HC) since its inception in 1996. The first design covers the period 1996–2006, the second design covers 2007–2016, and the third design was introduced in 2017 and is scheduled to continue until 2025. This report provides a detailed description of the first two sample designs: 1996–2006 and 2007–2016. It also provides information on target sample sizes, number of sampled units, number of completed interviews, and response rates for the panels of the MEPS from its inception in 1996 through 2016.

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Additional information on MEPS is available from the MEPS Project Director at MEPSProjectDirector@ahrq.hhs.gov.

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Sample Designs of the Medical Expenditure Panel Survey Household Component, 1996–2006 and 2007–2016

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Introduction

The Medical Expenditure Panel Survey (MEPS) Household Component, a nationally representative sample of the U.S. civilian noninstitutionalized population, has been conducted on an annual basis since 1996 by the Agency for Healthcare Research and Quality (AHRQ), U.S. Department of Health and Human Services (HHS). The MEPS provides national estimates of health care use, expenditures, sources of payment, and health insurance coverage as well as information on respondents' health status, demographic/socioeconomic characteristics, employment status, access to health care, and satisfaction with health care. The survey data can be used to produce estimates for persons and families at the national and regional levels for the full target population as well as for many population subgroups.

Three broad sample designs have been used for the MEPS Household Component (MEPS-HC) since its inception in 1996. The first design covers the period 1996–2006, the second design covers 2007–2016, and the third design was introduced in 2017 and is scheduled to continue until 2025. This report describes the first two sample designs of MEPS-HC: 1996–2006 and 2007–2016. Similar reports describe sample designs of MEPS for different time periods in the past. MEPS Methodology Report #2 details the sample design of the 1996 MEPS-HC, and MEPS Methodology Report #11 describes the 1997 MEPS design (Cohen S, 1997; Cohen S, 2000). MEPS Methodology Report #22 describes the MEPS-HC sample design for 1998–2007 and updates descriptions of earlier designs (Ezzati-Rice, et al. 2008). An additional report provides an overview of the core components of MEPS data collection and the statistical features of the survey (Cohen SB, 2003). In this report, we provide a comprehensive summary of the two designs prior to 2017 when the third design took effect. We also provide information on target sample sizes, number of sampled units, number of completed interviews, and response rates for the panels of the MEPS from its inception in 1996 through 2016. A future methodology report will describe the recently implemented 2017–2025 MEPS design.

General Features of MEPS-HC Sample Design

Overview

The MEPS-HC is a complex national probability survey of the U.S. civilian noninstitutionalized population. Each year a new panel of households is selected from among those households that participated in the previous year’s National Health Interview Survey (NHIS), another large ongoing federal health survey conducted by the National Center for Health Statistics of the Centers for Disease Control and Prevention in HHS. Each new MEPS annual sample is referred to as a panel. In the MEPS, data are collected for each panel through a series of five rounds of computer-assisted personal interviews (CAPI) over 30 months to yield annual data for 2 full calendar years.

A new MEPS panel of households has been selected and fielded each year since 1996. During each calendar year (with the exception of the first year in 1996), data were collected simultaneously for two MEPS panels as illustrated in Figure 1. One panel is in its first year of interviews (e.g., in the year 2015, Rounds 1 and 2 of Panel 20), while the prior year’s panel is in its second year of data collection (e.g., in 2015, Rounds 3, 4, and 5 of Panel 19). The reference period for Round 3 for each MEPS panel overlaps 2 calendar years.

Figure 1. MEPS Household Component Overlapping Panel Design

	2014			2015			2016		
Panel 19	Round1	Round2	Round3	Round4	Round5				
Panel 20				Round1	Round2	Round3	Round4	Round5	

In 1996, the first year of MEPS, only one panel (Panel 1) was fielded and the annual data for 1996 were based on this single panel of data. However, starting in 1997, to increase statistical power of annual estimates produced from MEPS, data are combined across two distinct nationally representative samples, making use of the MEPS overlapping panel design. More specifically, annual estimates are made by combining data from the panel in its first year of data collection and the panel in its second year of data collection. For example, 2015 annual estimates were produced using data collected for the second year of Panel 19 and data collected for the first year of Panel 20.

In addition to annual estimates, the MEPS design structure permits longitudinal estimates over 2 consecutive calendar years, thus allowing examination of person-level changes for select variables over a 2-year period. For example, analysts can assess the persistence of high health-care expenditures by examining whether individuals with low/high expenditures in one year have low/high expenditures in the subsequent year (Cohen SB and Ezzati-Rice TM, 2006).

MEPS Target Population and Sampling Frame

The target population for the MEPS consists of all persons who are members of the civilian noninstitutionalized population (e.g., not in prisons, nursing homes, or the military) at any time during the year and living in the 50 states or the District of Columbia. The NHIS serves as the sampling frame for the MEPS. In most years, the MEPS annual household panel sample is selected from responding households in two of the four NHIS panels (which are different than MEPS panels, see section below on overview of 1995–2005 design for an explanation of NHIS panels) during calendar quarters 1–3 of the previous year. The NHIS quarter 4 is not processed soon enough for use in selecting the following year’s MEPS sample as each new MEPS panel must be fielded beginning in mid to late January. Thus, a sample representing about three-eighths ($2/4$ panels \times $3/4$ quarters) of the NHIS responding households is generally made available for use in the MEPS.

Analytical Goals, Precision Requirements, and Sample Size Targets

The sample is designed to produce estimates to meet a specified level of precision at the national and regional level and for certain subgroups of the population such as selected racial and ethnic groups.

In general, broad sample design goals for the MEPS include:

- A sample that will provide unbiased national and regional estimates (four census regions) of health care expenditure estimates and other health parameters with targeted precision, and
- A sample that will meet targeted precision requirements for policy-relevant subgroups of the population.

Based on varying HHS objectives coupled with the MEPS budget resources available, the sample size and subdomains oversampled (i.e., groups that are sampled at a higher rate) for MEPS can vary from year to year. The MEPS person-level precision requirements are specified for national

estimates derived from individuals that are considered full-year respondents (individuals with responses for the entire period(s) during the year they were living in the civilian noninstitutionalized population—see https://meps.ahrq.gov/about_meps/hc_sample.shtml). In the determination of sample sizes necessary to achieve the precision requirements, adjustments are made for household (also referred to as dwelling unit or DU) nonresponse and survey attrition to determine the required number of initial sample units per year. Table 2 (for the 1996–2006 design) and Table 4 (for the 2007–2016 design) present the number of DUs selected in each MEPS panel. Table 5 presents the number of responding DUs, families, and persons in each year for the two MEPS panels combined and separately.

Sampling Unit Definition and Eligibility Criteria

The definition of DUs and group quarters in the MEPS-HC are generally consistent with the definitions employed for NHIS. The definitions used are:

- Dwelling unit (DU) is a house, apartment, group of rooms, or single room occupied as separate civilian noninstitutional living quarters or vacant but intended for occupancy as separate living quarters. This term is the NHIS definition for households and is the unit sampled for the MEPS.
- Group quarters consist of a single civilian noninstitutional dwelling or structure in which nine or more unrelated persons reside and where inhabitants are not considered a part of any other DU.

After selection of the NHIS households (occupied DUs and group quarters), “reporting units” are formed based on information collected in the NHIS and for fielding of the MEPS sample. A reporting unit (RU) is a person or group of persons in the sampled DU who are related by blood, marriage, adoption, foster care, or other family association. Each RU was interviewed as a single entity for MEPS. Thus, the RU serves chiefly as a family-based “survey” operations unit rather than an analytic unit per se. Regardless of the legal status of their association, two persons living together as a “family” unit are treated as a single RU if they choose to be so identified. Unmarried college students (less than 24 years of age) who usually live in a sampled household but who live away from home and go to school at the time of the MEPS interview are treated as a student RU separate from that of their parents for the purpose of data collection. However, data for a student RU is usually collected from the respondent of the parent RU. Examples of different types of RUs include:

- A married daughter and her husband living with her parents in the same DU constitute a single RU.
- A husband and wife and their unmarried daughter, age 18, who is living away from home while at college constitute two RUs (even though the student daughter is not interviewed).
- Three unrelated persons living in the same DU would each constitute a distinct RU, i.e., a total of three RUs.

Eligibility of Dwelling Units

In the two designs covered in this report, the only major difference in eligibility status for housing units between NHIS and MEPS is that college dorms represent ineligible DUs for MEPS.

College-aged students living away from home during the school year were interviewed at their place of residence for the NHIS, but, in contrast, such students are identified by and linked to their parents' household for MEPS. In other words, for the NHIS, college students living in student housing are sampled independently from their families. But for MEPS, such students are identified through the sample selection of their parents' RU. Once the MEPS sample is selected from among the NHIS households characterized as NHIS respondents, RUs representing students living in student housing or consisting entirely of military personnel are deleted from the sample. In MEPS, removing college students found in college housing sampled for the NHIS eliminates the opportunity of multiple chances of selection for MEPS for these students. Military personnel not living in the same RU as civilians are ineligible for MEPS. After such exclusions, all RUs associated with households selected from among those identified as NHIS responding households are then fielded in the first round of MEPS. The number of sampled DUs (households) for each MEPS panel is shown in Table A1 (Appendix A). However, new RUs are created when members of the household leave the primary RU between the NHIS and MEPS and are then followed according to the MEPS rules.

Interview Eligibility of Persons

Three critical factors define a person's interview status for each round of data collection in the MEPS. These factors are: "in-scope" status, "keyness" status, and "eligibility" status.

In-scope

A person is considered as in-scope for a MEPS interview round if he or she was a member of the U.S. civilian noninstitutionalized population at some time during the reference period covered by that round.

Keyness for MEPS—“Key and non-Key Persons”

Since the MEPS sample is a subsample of NHIS respondents, the chance of selection for MEPS is directly tied to the chance of selection to the NHIS. The term “Keyness” is related to whether an individual had a chance of being included in MEPS. A person is “Key” if he or she is linked for sampling purposes to the set of NHIS sampled households designated for inclusion in MEPS. Specifically, a “Key” person was a member of an NHIS household at the time of the NHIS interview or a person who became a member of such a household after being out-of-scope at the time the NHIS was fielded for their household (examples of the latter situation include newborns and persons returning from military service, an institution, or living outside the United States).

A “non-Key” person is one whose chance of selection for the NHIS (and MEPS) was associated with a household that was eligible but not sampled for the NHIS, and who later became a member of a MEPS RU. MEPS data are collected for the period of time a “non-Key” person is part of the sampled unit to provide information for family-level analyses. However, “non-Key” persons who leave a sample household unaccompanied by a “Key” in-scope member are not followed for subsequent interviews.

In summary, “Keyness” status is set at the time the person enters MEPS, and a person’s “Keyness” status never changes. It should be noted that a person might be “Key” even though they are not part of the civilian noninstitutionalized portion of the U.S. population. For example, a person in the military may have been living with his or her civilian spouse and children in a household sampled for NHIS. The person in the military would be considered a “Key” person for MEPS; however, such a person would not be eligible to receive a person-level sample weight if he or she was never in-scope during a defined survey reference period.

Eligibility

The eligibility of a person for MEPS pertains to whether or not data are to be collected for that person. All of the “Key” in-scope persons of a sampled RU are eligible for data collection. The only “non-Key” persons eligible for data collection are those who live in an RU with at least one “Key” in-scope person and eligibility continues only for the time they are living with at least one such person. The only out-of-scope persons who are eligible for data collection are those living with “Key” in-scope persons, again only for the time they live with such a person (only persons in the military can meet this description, e.g., a person on full-time active military duty, living with a spouse who is Key).

Link of MEPS to the National Health Interview Survey

The set of households selected for each panel of the MEPS-HC is a subsample of households that responded to the previous year's NHIS. The NHIS sampling frame for MEPS is a nationally representative sample of the U.S. civilian noninstitutionalized population. The use of a subsample of NHIS households provides budgetary savings by eliminating the need to independently list and screen households to locate selected policy-relevant subgroups of the population. Moreover, the MEPS to NHIS linkage provides valuable data on characteristics of MEPS nonrespondents that facilitate construction of analytic weights in a manner that reduces MEPS nonresponse bias. The linkage also provides an additional data point for enhanced longitudinal analyses (Cohen SB, 2003; Cohen SB, Makuc DM, Ezzati-Rice TM, 2007).

The records in each MEPS panel can be linked back to the corresponding records in the previous year's NHIS public use data file. For information on obtaining MEPS/NHIS link files, please see https://meps.ahrq.gov/mepsweb/data_stats/download_data_files.jsp. A discussion of weighting and estimation approaches for a MEPS/NHIS link file can be found in Chowdhury et al. (2012), which is available online at

https://meps.ahrq.gov/data_files/publications/workingpapers/wp_12005.pdf.

Overview of NHIS Sample Design

Since the MEPS sample of households is subsampled from the NHIS, some knowledge of the NHIS sample design is needed to understand the MEPS sample design. The NHIS has been in continuous operation since 1957. Every 10 years, following each Decennial Census, the NHIS sample is redesigned to accommodate the survey requirements and to reflect changes to the U.S. population and its distribution. Increased coverage of the target populations with an updated sample design based on data from the latest census improves the accuracy of the sample estimates. The subsample of households selected for each MEPS panel from 1996–2006 was based on the 1995–2005 NHIS sample design and the subsample of households selected for MEPS panels from 2007–2016 was based on the 2006–2015 NHIS sample design. Detailed information about the NHIS sample designs is available from the NCHS Web site. For example, the NCHS Series 2, Number 130 report describes the sample design of the 1995–2004 NHIS. The design for 1995–2004 was extended another year to cover the 2005 NHIS. The NCHS Series 2, Number 165 report describes the sample design of the 2006–2015 NHIS. A brief overview of the 1995–2005 and 1996–2015 NHIS designs are provided below.

Overview of 1995–2005 NHIS Sample Design

The 1995–2005 NHIS was based on a complex multistage sample design of the U.S. civilian noninstitutionalized population with stratification, clustering, and oversampling of selected population subgroups. The first stage of sample selection was an area sample of Primary Sampling Units (PSUs), with each PSU consisting of a single county or a group of contiguous counties or a metropolitan statistical area (MSA). Those PSUs defining the largest MSAs were selected with certainty and were designated as self-representing (SR) PSUs. The remaining PSUs in the universe were designated as non self-representing (NSR) or non-certainty PSUs and a sample of these PSUs was selected. The NSR PSUs were stratified by state and sampled into the NHIS using a probability proportional to population size according to the 1990 Census. A total of 358 PSUs was selected for the 1995–2005 NHIS.

At the second stage of sampling, the entire area within each selected PSU was partitioned into segments consisting of single or contiguous blocks or block equivalents. These segments served as the Second Stage Units (SSUs). In parts of the country where local governments issue building permits, the area sample was supplemented with a sample of permits for residential housing units built after the Decennial Census in order to produce as current a sample of households as possible. So within each sample PSU, the area segments and permit frame listings defined the SSUs. The area segments were assigned to density strata defined by the concentration of blacks and Hispanics from the 1990 Decennial Census. The building permit frame listing within a PSU was included as its own substratum. The area segments or permit frame listings within each density stratum were grouped into “super-segments” or “super-SSUs” consisting of clusters of housing units. These super-segments were subsequently sampled for use over the life of the planned NHIS design (i.e., a 10-year data collection period that was extended for an additional year to 2005). Reserve samples for 2 additional years were also selected. Households within super-segments were subsequently assigned to each calendar year, quarter, and week of NHIS data collection. Households containing Hispanics and blacks were oversampled at rates of approximately 2 and 1.5 times that of the remaining households, respectively. The oversampling was done at two different levels. First, households in census blocks or “combined blocks” with higher densities of blacks or Hispanics were selected at a higher rate; then, households with one or more black or Hispanic persons were screened in at a higher rate.

The annual NHIS sample of households was partitioned into four sub-designs, referred to as “panels,” each with approximately the same number of households (NHIS, Series 2 report). (The word “panel” used for the NHIS in this context should not be confused with the term’s

more common meaning of a follow-up longitudinal survey like the MEPS.) The two main objectives of the NHIS panel sub-design structure are: 1) to provide nationally representative sub-designs with “similar” features but with smaller sample sizes to deal with any potential NCHS budget exigencies for the NHIS; and 2) to provide a subsample for use as a sampling frame for a smaller “follow-on” survey (i.e., a survey whose sample design is then said to be linked with that of the NHIS) such as MEPS. Panels can be further subdivided by sample assignment weeks (e.g., calendar quarters) to provide even smaller surveys. This sub-design structure also enables NCHS to produce early release estimates (e.g., insurance coverage) prior to the availability of data for all calendar quarters. Each NSR PSU was assigned to one of the four panels, while each SSU within an SR PSU was allocated to one of the four panels. The panels were identified by panel labels 1, 2, 3, or 4. Typically, a PSU or an SSU is assigned a panel label that remains fixed for the life of the survey. Starting with the 1995–2005 design, two of the four NHIS panels (labelled 1 and 3) were reserved for use by AHRQ for the MEPS.

The NCHS Series 2, Number 130 report provides more details of the NHIS sample design for 1996–2005, and is available at https://www.cdc.gov/nchs/data/series/sr_02/sr02_130.pdf.

Overview of 2006–2015 NHIS Sample Design

As for earlier NHIS sample designs, the 2006–2015 NHIS design was based on a stratified multi-stage sample design. The 2006 NHIS sample of households was sampled independently from that which was selected under the 1995–2005 design. However, the fundamental design structure of the 2006 NHIS sample design was very similar to the previous sample design, which was in place from 1995–2005. The target universe for the 2006–2015 NHIS was also all DUs in the U.S. that contain members of the civilian noninstitutionalized population. As in the previous design, the target universe was first partitioned into PSUs consisting of a single county or a group of contiguous counties or a metropolitan statistical area (MSA). The PSUs containing the largest MSAs were selected with certainty and were designated as SR PSUs. The remaining PSUs were designated as NSR or non-certainty PSUs which were sampled. Most of the SR PSUs of the previous design were still SR in the 2006–2015 design. The differences in the location of the PSUs between the two designs occurred mostly in the NSR areas. The 2006–2015 design had 428 PSUs compared to 358 in the previous design. The difference in the number of PSUs was largely due to differences in how the PSUs were defined. In the 2006–2015 design, most of the SR PSUs in the NHIS were partitioned into mini-PSUs, i.e., smaller geographic areas (one or more counties) known as SPSUs or stratification PSUs, resulting in a larger number of PSUs.

Oversampling of black and Hispanic households was retained in the new 2006 NHIS design to facilitate estimation of health-related statistics for these two minority groups. An oversample of the Asian population was also incorporated. As in the previous design, each selected PSU was partitioned into a substrata consisting of single or contiguous blocks or block equivalents. These substrata were assigned to density strata defined by the concentration of blacks, Hispanics, and Asians from the 2000 Decennial Census while new construction housing (or permit listings) within a PSU was included as its own substratum similar to the previous design. Also, the definitions that constituted low, medium, and high concentrations of each minority group were allowed to vary slightly from PSU to PSU in contrast to the previous design where the definitions were consistent across all PSUs. Finally, as with the previous design, the area segments within each density stratum were partitioned into super-segments or clusters of housing units which were sampled for use over the 10-year period of the 2006–2015 NHIS design. Also, as in the previous design, the annual sample of households was partitioned into four sub-designs, referred to as “panels.” Each of these four panels were nationally representative with approximately the same number of households and two (labelled 1 and 4) were reserved for the MEPS.

The NCHS Series 2, Number 165 report provides a more detailed description of the 2006–2015 NHIS sample design and is available at https://www.cdc.gov/nchs/data/series/sr_02/sr02_165.pdf.

MEPS Sample Designs

1996–2006 MEPS Sample Design and Selection (Panels 1–11)

For the 1996–2006 MEPS design (i.e., MEPS Panels 1–11), households were selected from 195 of the 358 NHIS sampled PSUs (except in 1999 and 2000 when only 100 PSUs were used due to budgetary constraints). In 2002, some design enhancements were made with an increased sample size and the number of PSUs used was brought back up to 195 as in the earlier MEPS panels. The sample was generally selected from the first three calendar quarters of households from the two NHIS panels allocated for MEPS (NHIS Panels 1 and 3) as was done for the 1995–2005 NHIS design.

The MEPS sampling frame includes NHIS households that meet the following criteria:

- Responding Household: NHIS household with ACTION code 10 (complete interview) or ACTION code 4 (partial interview, no follow-up) and at least one person with HHSTAT (household status) not equal to D (deleted).

- Eligible Household: All responding households in the NHIS quarters and panels set aside for MEPS. (In most years, the households eligible for MEPS are from calendar quarters 1–3 in 2 of 4 NHIS panels.)

Prior to sample selection, the NHIS-occupied DUs within pre-specified sampling domains are hierarchically sorted by the following measures:

- Calendar year quarter
- Interview week within each respective calendar quarter
- Census division
- State
- MSA classification
- NHIS PSU
- NHIS segment within PSU

The available NHIS households on the MEPS frame were stratified hierarchically into mutually exclusive sampling domains that varied slightly from year to year (see Tables 1 and A1). For example, in the years when Asian, Hispanic, black, and Other domains were used, the domains were created hierarchically as follows:

1. If a household contained any Asian member, the entire household is classified as an Asian household.
2. Among the remaining households, if a household contained any Hispanic member, the household is classified as a Hispanic household.
3. Then, among the remaining households, if a household contained any member classified as black, the household is classified as a black household.
4. Finally, if a household is not in any of the three previous strata it is classified as an Other household.

The initial sample size for each panel of the MEPS was determined on the basis of the budget resources available at the time of sample selection and on the eligible sample available from NCHS. As a result, sample sizes have varied from year to year. In the next paragraph, a review of the 1996 and 1997 MEPS is provided, followed by more specific details for the 1998–2006 MEPS.

The 1995 NHIS subsample selected for the 1996 MEPS (Panel 1) consisted of 195 PSUs. An initial subsample of 10,597 households was selected from NHIS Panels 1 and 3 in two targeted

quarters (2 and 3) of the NHIS (Table 2). The 1997 MEPS panel (Panel 2) sample of 6,300 households was selected in the same 195 PSUs (as in MEPS 1996) and was selected as a subsample of households responding to the 1996 NHIS Panels 1 and 3 in three NHIS quarters (1, 2, and 3). Both the 1996 and 1997 MEPS reflected an inherited oversample of Hispanics and blacks at the same ratios as in the NHIS (Hispanics, 2.0:1; blacks 1.5:1). In addition, the 1997 MEPS oversampled several policy-relevant domains (see Table 1).

Table 1. Summary of Oversampling Domains in MEPS 1996–2006

Year	Panel	Oversampling Domains ¹				
1996	1	-	-	-	-	-
1997	2	18+ yrs with limitations	18-64 yrs with predicted high medical expenditures	<18 yrs with limitations	Predicted poor	Persons with other limitations
1998	3	-	-	-	-	-
1999	4	-	-	-	-	-
2000	5	-	-	-	-	-
2001	6	-	-	-	-	-
2002	7	Asian/Predicted poor	-	-	-	-
2003	8	Asian/Predicted poor	-	-	-	-
2004	9	Asian/Predicted poor	-	Black	-	-
2005	10	Asian/Predicted poor	-	Black	-	-
2006	11	Asian/Predicted poor	-	Black	-	-

¹See Appendix Table A1 for detailed definitions of domains.

The sample of households for MEPS panels 3–6 (1998–2001) ranged from 5,166 to 10,704 households (Table 2). The sample of households for MEPS panels 7–11 (2002–2006) from the 2001–2005 NHIS, ranged from 8,132 to 9,464 households. As in the earlier years, the oversample of Hispanics and blacks in the NHIS carried over to MEPS. In addition, the NHIS responding households eligible for MEPS that contained either Asian Americans or families predicted (based on a statistical model) to be “poor” (i.e., income <200 percent of the federal poverty level) were selected with certainty. For MEPS panels 9–11 (2004–2006), in addition to the certainty selection of Asians and predicted poor families, households containing blacks that were not among those households selected with certainty were further oversampled with certainty, in addition to the earlier oversampling of these households in NHIS. The sampling rates by subdomains, the

number of selected NHIS households, number of PSUs, and number of initial MEPS RUs by MEPS panel and year are shown in Table A1. (Note: The sample sizes presented in Table 2 are confined to the new panel introduced each year. The number of responding families and persons used in producing annual estimates from two consecutive panels are shown in Table 5.)

Table 2. MEPS Households Selected from the Frame (NHIS)¹ for MEPS 1996–2006

Year	Panel	Frame/ Sample	Total	Sampling Domain		
				Asian/Poor	Black	Other
1996	P1	Frame	10,597	NA	NA	NA
		Sample	10,597	NA	NA	NA
		% Selected	100%	NA	NA	NA
1997	P2	Frame	14,706	footnote 2	footnote 2	footnote 2
		Sample	6,300	footnote 2	footnote 2	footnote 2
		% Selected	42.8%	footnote 2	footnote 2	footnote 2
1998	P3	Frame	5,166	NA	NA	NA
		Sample	5,166	NA	NA	NA
		% Selected	100%	NA	NA	NA
1999	P4	Frame	7,301	NA	NA	NA
		Sample	6,900	NA	NA	NA
		% Selected	94.5%	NA	NA	NA
2000	P5	Frame	7,263	NA	NA	NA
		Sample	5,380	NA	NA	NA
		% Selected	74.1%	NA	NA	NA
2001	P6	Frame	14,508	NA	NA	NA
		Sample	10,704	NA	NA	NA
		% Selected	73.8%	NA	NA	NA
2002	P7	Frame	14,510	2,671	NA	11,839
		Sample	8,132	2,671	NA	5,461
		% Selected	56.0%	100%	NA	46.1%
2003	P8	Frame	13,628	2,448	NA	11,180
		Sample	8,400	2,448	NA	5,952
		% Selected	61.6%	100%	NA	46.1%

Year	Panel	Frame/ Sample	Total	Sampling Domain		
				Asian/Poor	Black	Other
2004	P9	Frame	13,618	2,566	1,394	9,658
		Sample	8,640	2,566	911	5,163
		% Selected	61.6%	100%	65.4%	53.5%
2005	P10	Frame	13,218	2,575	1,387	9,256
		Sample	8,546	2,575	1,040	4,931
		% Selected	64.6%	100%	75.0%	53.3%
2006	P11	Frame	14,224	2,685	1,474	10,065
		Sample	9,464	2,685	1,106	5,673
		% Selected	66.5%	100%	75.0%	56.4%

¹MEPS frame includes 3/8 of the NHIS full responding sample.

²See Appendix Table A.1 for domains used in 1997.

NA: not applicable

2007–2016 MEPS Sample Design and Sample Selection (Panels 12–21)

For the 2007–2016 MEPS design (Panels 12–21), 183 PSUs were used in selecting the MEPS sample from the 428 total NHIS PSUs. NHIS Panels 1 and 4 were set aside for use in the 2007–2016 MEPS design to maximize the number of overlapping PSUs utilized from the previous 1996–2006 design and thereby mitigate increased MEPS data collection costs.

Except for Panel 12, which was sampled from only 2 quarters, each new MEPS panel was sampled from the first 3 calendar quarters of the prior year’s responding NHIS annual sample among the two NHIS panels (1 and 4). To reduce operational issues associated with fielding a new sample design in the same year as implementation of a new Windows-based CAPI instrument, the MEPS sample was limited to eligible responding housing units from the first two calendar quarters of the NHIS Panels 1 and 4 of the 2006 NHIS.

The frame for selecting the MEPS sample was created the same way it was created for panels in the MEPS 1996–2006 sampling. All responding households in NHIS quarters 1–3 within NHIS panels 1 and 4 were used as the frame for the 2007–2016 MEPS design. All households with complete interview (ACTION code 10), or partial interview (ACTION code 4) and at least one person with HHSTAT (household status) not equal to D (deleted) were included on the frame.

The household-level sampling domain variables varied only slightly from year to year (see Tables 3 and A1). Also, to increase operational efficiency, since Panel 16, the “Other” domain has been separated into two domains: households with a complete response in NHIS (Other-complete) and households with a partial response in NHIS (Other-partial). Since the households in the Other-partial domain are generally less cooperative and require extra follow up, these households are selected at a lower rate than the complete households to make the design more responsive (Mirel LB and Chowdhury SR, 2017). The sample was selected independently within each domain. Similar to the previous design, the available NHIS households on the MEPS frame were stratified hierarchically into mutually exclusive sampling domains.

Up to 2009 (MEPS Panel 14), the sample of DUs was selected the same way it was selected in the previous design. DUs were selected systematically with equal weight within each sampling domain after sorting hierarchically by the same set of variables used for the panels in the previous design.

Starting with 2010 (MEPS Panel 15) a probability proportional to size (PPS) sampling was introduced to select households from NHIS to MEPS in non-certainty domains (i.e., non-minority Other households). The purpose of the PPS sampling is to reduce the variation in MEPS base weights and thereby increase the precision of MEPS estimates (Chowdhury SR and Baskin RM, 2014). However, since the sampling rate is 100 percent in minority domains, the PPS sampling is applied to reduce the variation in base weights only in the Other-complete and Other-partial domains. For the PPS selection, since the NHIS final household weight is not available when the MEPS sample needs to be selected, either the interim or a predicted version of the NHIS household weight is used as the measure of size. The interim NHIS household weight is the NHIS final household base weight without the nonresponse adjustment. The sort variables used in the PPS sampling were: calendar year quarter, census region, state, MSA classification, NHIS PSU, within PSU stratum code for NHIS, and NHIS segment.

During the 2006–2016 period, the MEPS sample size ranged from 7,319 to 10,610 households (Table 4). As in the earlier years, the Hispanic and black households were oversampled. Households that contained either Asians or families predicted as poor (i.e., income <200 percent of the federal poverty level) were selected with certainty in 2007 and 2008 Panels 12–13) but households predicted as poor were no longer oversampled in subsequent panels, e.g., Panels 14–21. Only Asian, Hispanic, and black households were oversampled in 2009–2016, except in 2011 when the households with one or more cancer patients (based on prior year NHIS data) were also oversampled (Table 3). A household with one or more members with cancer in the household was

defined as a Cancer household. A self-administered questionnaire supplement on cancer (termed the CSAQ) was implemented on cancer survivors. All oversampled domains mentioned above were sampled for MEPS with certainty from the frame. Only the households in the Other domain (which was separated into Other-complete and Other-partial starting in 2011; see Table 4) were not sampled with certainty. The sampling rates by subdomains, number of NHIS households selected, number of PSUs, and number of initial MEPS RUs by MEPS panel and year are shown in Table A1. (Note: The sample sizes presented in Tables 4 and A1 are confined to the new panel introduced each year.)

Table 3. Summary of Oversampling Domains in MEPS 2007–2016

Year	Panel	Oversampling Domains ¹				
2007	12	Asian/Predicted Poor	Hispanic	Black		-
2008	13	Asian/Predicted Poor	Hispanic	Black		-
2009	14	Asian	Hispanic	Black		-
2010	15	Asian	Hispanic	Black		-
2011	16	Asian	Hispanic	Black	Other-Complete/Partial ²	Cancer
2012	17	Asian	Hispanic	Black	Other-Complete/Partial	-
2013	18	Asian	Hispanic	Black	Other-Complete/Partial	-
2014	19	Asian	Hispanic	Black	Other-Complete/Partial	-
2015	20	Asian	Hispanic	Black	Other-Complete/Partial	-
2016	21	Asian	Hispanic	Black	Other-Complete/Partial	-

¹See Appendix Table A1 for detailed definitions of domains.

²Since 2011, the Other household domain was separated into Other-complete and Other-partial domains, and the Other-complete domain was sampled at a higher rate than the Other-partial domain to reduce data collection effort.

Table 4. MEPS Households Selected from the Frame (NHIS)¹ for MEPS 2007–2016

Year	Panel	Frame/ Sample	Total	Asian/Poor/ Cancer ²	Sampling Domain				
					Hispanic	Black	Other- Total	Other- Complete	Other- Partial
2007	P12	Frame	8,055	1,723	970	884	4,478	NA	NA
		Sample	7,319	1,723	970	884	3,742	NA	NA
		% Selected	90.9%	100%	100%	100%	83.6%	NA	NA
2008	P13	Frame	12,452	2,632	1,855	1,498	6,467	NA	NA
		Sample	9,703	2,632	1,855	1,498	3,718	NA	NA
		% Selected	77.9%	100%	100%	100%	57.5%	NA	NA
2009	P14	Frame	12,181	834	2,386	2,019	6,942	NA	NA
		Sample	9,700	834	2,066	1,816	4,984	NA	NA
		% Selected	79.6%	100%	86.6%	89.9%	71.8%	NA	NA
2010	P15	Frame	12,390	860	2,579	1,994	6,957	NA	NA
		Sample	8,750	860	1,961	1,705	4,224	NA	NA
		% Selected	70.6%	100%	76.0%	85.5%	60.7%	NA	NA
2011	P16	Frame	12,067	1,708	2,386	1,894	NA	4,272	1,807
		Sample	10,180	1,708	2,386	1,894	NA	3,354	838
		% Selected	84.4%	100%	100%	100%	NA	79%	46%
2012	P17	Frame	13,701	1,075	2,762	2,053	NA	6,426	1,385
		Sample	9,700	1,075	2,762	2,053	NA	3,256	554
		% Selected	70.8%	100%	100%	100%	NA	51%	40%
2013	P18	Frame	12,565	1,018	2,641	1,990	NA	5,342	1,574
		Sample	9,700	1,018	2,641	1,990	NA	3,368	683
		% Selected	77.2%	100%	100%	100%	NA	63.1%	43.4%
2014	P19	Frame	12,313	976	2,628	2,002	NA	5,360	1,347
		Sample	9,700	976	2,628	2,002	NA	3,531	563
		% Selected	78.8%	100%	100%	100%	NA	65.9%	41.8%
2015	P20	Frame	12,109	954	2,706	1,881	NA	5,117	1,451
		Sample	10,610	954	2,706	1,881	NA	4,304	765
		% Selected	87.6%	100%	100%	100%	NA	84.1%	52.7%

Year	Panel	Frame/ Sample	Total	Asian/Poor/ Cancer ²	Sampling Domain				
					Hispanic	Black	Other- Total	Other- Complete	Other- Partial
2016	P21	Frame	11,336	963	2,518	1,801	NA	4,551	1,503
		Sample	9,700	963	2,518	1,801	NA	3,685	733
		% Selected	85.6%	100%	100%	100%	NA	81.0%	48.8%

¹MEPS frame includes 3/8 of the NHIS full responding sample.

²Poor households in Panel 13 only and Cancer households in Panel 16 only

NA: not applicable

Sample Yields and Response Rates in MEPS

Responding Sample Size

As mentioned earlier, to produce MEPS annual calendar year (full-year) estimates, data are combined across two overlapping panels. An early data file is also produced in MEPS, which allows selected “point-in-time” estimates for the early part of the year to be produced. Table 5 provides a summary of the number of completed interviews (DUs, families, and persons) by year and panel based on the annual Full-Year Consolidated Files. Tables A2 and A3 in Appendix A provide the number of completed person-level interviews by age group, gender, race/ethnicity, region, and MSA status for annual full-year files.

Table 5. Number of responding dwelling units, families, and persons by year and panel in MEPS Household Component Full-Year Files, 1996–2016

Year	Panel	Dwelling Units	Families ¹	Persons
1996	Panel 1	8,095	8,588	21,571
1997	Combined	12,043	12,986	32,636
	Panel 1	7,366	7,925	19,622
	Panel 2	4,677	5,061	13,014
1998	Combined	8,318	8,920	22,953
	Panel 2	4,408	4,756	12,260
	Panel 3	3,910	4,164	10,693
1999	Combined	8,671	9,278	23,565
	Panel 3	3,639	3,925	9,979
	Panel 4	5,032	5,353	13,586

Year	Panel	Dwelling Units	Families¹	Persons
2000	Combined	8,849	9,437	23,839
	Panel 4	4,850	5,195	13,170
	Panel 5	3,999	4,242	10,669
2001	Combined	11,864	12,732	32,122
	Panel 5	3,836	4,114	10,298
	Panel 6	8,028	8,618	21,824
2002	Combined	13,689	14,712	37,418
	Panel 6	7,677	8,326	20,890
	Panel 7	6,012	6,386	16,528
2003	Combined	11,929	12,742	32,681
	Panel 7	5,771	6,147	16,000
	Panel 8	6,158	6,595	16,681
2004	Combined	12,043	12,917	32,737
	Panel 8	5,910	6,358	16,058
	Panel 9	6,133	6,559	16,679
2005	Combined	11,918	12,680	32,320
	Panel 9	5,832	6,278	15,904
	Panel 10	6,086	6,402	16,416
2006	Combined	12,127	12,729	32,577
	Panel 10	5,725	6,056	15,458
	Panel 11	6,402	6,673	17,119
2007	Combined	11,043	11,516	29,370
	Panel 11	6,118	6,391	16,355
	Panel 12	4,925	5,125	13,015
2008	Combined	11,516	12,228	31,262
	Panel 12	4,655	4,890	12,314
	Panel 13	6,861	7,338	18,948
2009	Combined	12,901	13,780	34,920
	Panel 13	6,542	7,076	18,075

Year	Panel	Dwelling Units	Families ¹	Persons
	Panel 14	6,359	6,704	16,845
2010	Combined	11,734	12,374	31,228
	Panel 14	6,069	6,416	16,055
	Panel 15	5,665	5,958	15,173
2011	Combined	12,551	13,380	33,622
	Panel 15	5,390	5,717	14,370
	Panel 16	7,161	7,663	19,252
2012	Combined	13,694	14,678	37,182
	Panel 16	6,833	7,377	18,313
	Panel 17	6,861	7,301	18,869
2013	Combined	12,885	13,885	35,068
	Panel 17	6,504	7,018	17,745
	Panel 18	6,381	6,867	17,323
2014	Combined	12,346	13,334	33,162
	Panel 18	6,134	6,699	16,579
	Panel 19	6,212	6,635	16,583
2015	Combined	12,886	13,713	33,893
	Panel 19	5,929	6,402	15,730
	Panel 20	6,957	7,311	18,163
2016	Combined	12,884	13,492	33,259
	Panel 20	6,535	6,905	16,823
	Panel 21	6,349	6,587	16,436

¹Families defined by variable FAMID[yy] where FMRS1231 = 1

Design Effects

While sample size is often used as an indicator of the precision of estimates obtained from a survey, the sample size of one survey is not directly comparable to that of another survey due to complexities of corresponding survey designs. The effectiveness of a sample size for precision of estimates in complex sample surveys such as the MEPS or the NHIS depends on many other factors that relate to design specifications including the stratification, clustering, and multi-stage

structure of the sample. The NHIS sample is clustered and has multiple stages of sampling, including oversampling of selected minority groups. These NHIS design specifications are an inherited and integral part of the MEPS sample design. Moreover, MEPS households are often selected from the NHIS frame with unequal probabilities, and there is nonresponse to the NHIS and then to the first MEPS interview, and attrition in subsequent rounds. MEPS survey weights account for both NHIS and MEPS differential sampling probabilities and nonresponse. Moreover, the construction of survey weights involves post-stratification to external control totals. All these adjustments make the MEPS weights highly unequal, which also affects the precision of estimates. Estimates based on a complex sample design like MEPS usually have a higher variance than they would if based on a simple random sample design due to clustering, multistage sample selection, and unequal weighting. For a fixed sample size, the ratio of the variance of an estimate under a complex design to the variance of the same estimate under a simple random sample design is called the design effect. To compare sample sizes under different designs, the sample size in a complex design can be divided by the design effect to get the statistically equivalent sample size (i.e., effective sample size) under a simple random sample design. Table 6 provides design effects for two main MEPS estimates (percent insured and mean healthcare expense per person) in the 1996–2006 and 2007–2016 MEPS designs. Design effects appear to be slightly higher in the second design than in the first design. For percent insured, the average design effect is 3.65 in the first design and 4.85 in the second design, and, for mean expense, the average design effect is 2.07 in the first design and 2.38 in the second design. Even under the same design, design effects differ across variables due to variations in distributions and clustering of the variables. Design effects can also vary from year to year for the same variable because of the randomness of the sample across years.

Table 6. Design effects of selected variables in MEPS, 1996–2006 and 2007–2016

Year	Insured (<65 yrs of age)		Total Expenses	
	Percent	Design Effect	Mean Per Person (\$)	Design Effect
First design				
1996	87.8	3.7	2,038	1.6
1997	87.7	3.9	2,039	2.2
1998	88.1	3.7	2,049	1.9
1999	89.1	3.1	2,156	2.1
2000	88.3	4.5	2,255	2.0
2001	88.3	3.6	2,555	1.9
2002	88.2	4.0	2,813	2.1

Year	Insured (<65 yrs of age)		Total Expenses	
	Percent	Design Effect	Mean Per Person (\$)	Design Effect
2003	87.9	3.2	3,082	2.4
2004	87.7	3.8	3,284	2.4
2005	87.6	3.2	3,457	2.5
2006	87.4	3.4	3,452	1.7
Average¹	88.01	3.65	2,652	2.07
Second design				
2007	86.7	3.4	3,737	1.8
2008	86.6	4.4	3,773	2.2
2009	86.5	5.9	4,107	2.8
2010	86.9	4.6	4,094	2.1
2011	87.5	4.3	4,277	1.8
2012	87.3	5.7	4,309	3.0
2013	87.2	6.0	4,436	2.5
2014	90.2	5.2	4,708	2.6
2015	91.9	4.1	4,978	2.8
2016	92.4	4.9	5,006	2.2
Average¹	88.32	4.85	4,342	2.38

¹Simple unweighted average across years

Response Rates

Because of the linkage between the NHIS and the MEPS, the overall response rate for MEPS is a combination of the response rate in the NHIS and round-specific response rates in MEPS. Also, since the sample size in MEPS full-year files include samples from two overlapping panels, the calculation of the final annual response rate involves applying composite factors for each panel to panel-specific response rates (the same compositing factors are used to derive the annual estimation weight for the combined panels). Appendix B (which includes Table B1) illustrate the procedure used in calculating the 2016 final MEPS response rate.

The NHIS, MEPS panel-specific, and MEPS overall (i.e., combined panel) response rates for each estimation year from 1996–2006 are shown in Table 7. These response rates are unweighted and reflect response to both the NHIS and the multiplicative MEPS round-specific response rates (see Appendix B). The overall MEPS response rate has decreased steadily over the 20-year period due to the combined impact of declines in the NHIS response rate (from about 94 to 71 percent) and the MEPS conditional response rate (from about 75 to 63 percent). It should be noted that the

standardized response rates shown in Table 7 for 1996–2000 are slightly different from those in the 1996 and 1997 MEPS Sample Design Reports (See Cohen S, 1997, and Cohen S, 2000) and in the public use file documentation due to a slight difference in the calculation methods.

Table 7. MEPS individual panel and combined annual response rates

Calendar Year	Response Rate (%)								
	Year 1 Panel			Year 2 Panel			Combined Overall		
	NHIS	MEPS ¹	Compositing Factor ²	NHIS	MEPS ¹	Compositing Factor ²	NHIS	MEPS ¹	MEPS Final
1996	93.9	74.8	NA	NA	NA	NA	93.9	74.8	70.2
1997	93.8	73.8	0.50	93.9	67.6	0.50	93.9	70.7	66.4
1998	93.3	75.9	0.50	93.8	69.3	0.50	93.6	72.6	67.9
1999	92.2	71.0	0.50	93.3	67.6	0.50	92.8	69.3	64.3
2000	92.2	74.1	0.55	92.2	69.1	0.45	92.2	71.3	65.8
2001	89.9	74.3	0.33	92.2	70.9	0.67	90.7	73.2	66.3
2002	89.7	73.1	0.55	89.9	71.2	0.45	89.8	72.1	64.7
2003	90.6	72.7	0.49	89.7	70.1	0.51	90.2	71.5	64.4
2004	90.3	70.3	0.49	90.3	69.2	0.51	90.4	69.8	63.1
2005	87.9	70.8	0.50	90.3	66.8	0.50	89.1	68.8	61.3
2006	87.3	66.7	0.47	87.9	66.6	0.53	87.6	66.6	58.3
2007	88.1	63.3	0.56	87.3	63.5	0.44	87.7	63.4	55.6
2008	87.4	70.7	0.39	88.1	62.9	0.61	87.7	67.7	59.3
2009	85.2	65.1	0.52	87.4	67.2	0.48	86.3	66.2	57.2
2010	84.0	64.6	0.51	85.2	62.0	0.49	84.6	63.3	53.5
2011	80.6	71.1	0.43	84.0	61.4	0.57	82.1	66.9	54.8
2012	82.9	70.1	0.49	80.6	67.5	0.51	81.8	68.8	56.3
2013	78.0	65.1	0.51	82.9	66.0	0.49	80.5	65.6	52.8
2014	76.2	63.6	0.50	78.0	62.3	0.50	77.1	63.0	48.6
2015	75.1	65.2	0.46	76.2	60.5	0.54	75.6	63.1	47.7
2016	71.2	65.0	0.51	75.1	60.9	0.49	73.2	62.9	46.0

¹Response rate in MEPS only, i.e., conditional on NHIS

²Factor used for the panel to derive composite weight when two panels are combined to produce annual estimates

NA: not applicable

Analysis Weights and Variance Estimation

Development of Analysis Weights

Weights are developed for use in the derivation of nationally representative population estimates based on complex national sample surveys like MEPS. The analytic weights typically account for any disproportionate probabilities of selection, unit nonresponse, and an adjustment to make sure that the weighted sample distributions agree with known population totals. In general, the development of MEPS weights for a new panel involves a series of derivations and adjustments starting with the household sample selection base weight derived from the NHIS final household weight followed by an adjustment for DU nonresponse at MEPS Round 1, an adjustment for nonresponse at the person level to account for survey attrition across the multiple rounds of data collection, and a final step of post stratification/raking adjustments to known population totals for the U.S. civilian noninstitutionalized population. Similar procedures are applied to both panels except that the starting weight for the second year panel is the final weight from the first year of MEPS. Then, a combined-panel weight is derived by compositing the weights of both panels. More detailed information on the weight construction procedures used in MEPS can be found in Machlin, Chowdhury, et al. (2010), Wun et al. (2007), and on the MEPS Web site at <https://meps.ahrq.gov>.

Variance Estimation

Because MEPS is based on a complex-probability sample design, analytic approaches developed for data from a simple random sample are not appropriate for MEPS. Standard statistical estimation software procedures that assume simple random sampling do not properly account for the variability in the MEPS estimates attributable to the complexity in the MEPS design and estimation procedures. Estimates of variability for MEPS estimates (such as the standard error or corresponding confidence interval) should be calculated by using appropriate statistical software procedures. Several methodologies have been developed for estimating standard errors for surveys with a complex sample design, including the Taylor-series linearization method, balanced repeated replication, and jackknife replication. A variety of software packages provide analysts with the capability of implementing these methodologies. Software packages that permit the use of the Taylor-series linearization method are SUDAAN, Stata svy commands, SAS Survey Procedures (SAS version 8.2 and higher), the R survey package, and SPSS (version 12.0 and higher). Users of these software packages should refer to the corresponding software user documentation for complete information on the capabilities of

each package. The three variables on MEPS public use files needed to calculate appropriate Taylor-series standard errors for estimates are variance strata (VARSTR), variance PSU (VARPSU), and the survey weight (e.g., PERWTyyF). More information and examples of statistical software programming code can be found at

https://meps.ahrq.gov/mepsweb/survey_comp/clustering_faqs.jsp.

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Appendix A

MEPS sample sizes by selected characteristics, 1996-2016

Definitions for Table A1:

NHIS Responding Household. A household (HH) with ACTION = 10 (complete interview) or 4 (partial interview, no follow-up) and at least one person with HHSTAT ne D (deleted) is defined as responding for creating the MEPS sampling frame.

Eligible Household. NHIS responding HH in quarters and panels assigned for MEPS. In the 2007 MEPS sample, responding HHs are also eligible HHs, because the NHIS data comprised only the “MEPS” panels (for 2007, panels 1 and 4).

Sampling Domain. An HH classification to describe persons or reporting units (RUs) in the HH based on information collected in the NHIS. There were no domains used for sampling from 1996–2001 except in 1997 when the sample was selected from seven domains. Beginning with the 2002 MEPS, samples were drawn from three or more domains.

The 1997 MEPS was sampled from the following seven hierarchical domains, i.e., an HH in a specified domain would not have been sampled in a previously listed domain:

<i>Domain</i>	<i>Definition</i>
Adult ADL	At least one adult in HH has an ADL or IADL ((AGE = 70+ & ADLIADL1 = 1) or (AGE = 18-69 & ADLIADL2 = 1)).
Child	At least one child in HH has a limitation ((AGE = 0-4 & LIMCHILD = Limit 0,1) or (AGE = 5-17 & SCHOOLAT = 1-4) or (AGE = 0-17 & ANYLIMOT = 1)).
High Expense	At least one adult in HH (age 18-64) has probability >.40 of high expenditures.
Predicted Poor	At least one person in HH has probability >.30 of low family income.
Other Limit	At least one adult in HH has an “other limitation” (AGE = 18-69 & ADLIAD2X = 2 & WORKLIMT = 1) or (AGE = 70+ & ADLIAD1X = 2).
Age 65	At least one person in HH is age 65 or older.
Other	HH is not in another domain.

Beginning with the 2002 MEPS sample, the following domains have been defined:

<i>Domain</i>	<i>Definition</i>
Asian	At least one person in HH is Asian (RACE_12 = 5-15 in 2002-2004 MEPS. Beginning with 2005 MEPS: NEWRACE = 3 [or RACE_1 = 9-15]).

<i>Domain</i>	<i>Definition</i>
Predicted Poor	At least one RU in HH has probability of poverty >.30; probability was constructed from the regression model that was developed for the 1997 MEPS sampling.
Hispanic	HH is not Asian, not poor, has at least one Hispanic person (NATOR = 1). First used for 2007 MEPS sample.
Black	HH is not Asian, not poor, not Hispanic, has at least one black person. First used for 2004 MEPS (defined as RACE_12 = 2). Beginning with 2005 MEPS: NEWRACE = 2 [or RACE_1 = 2]).
Other	HH is not in another domain.

Beginning with the 2009 MEPS sample, the “Predicted Poor” domain was no longer used.

Beginning with the 2011 MEPS sample, the Other category was subdivided into Other-complete and Other-partial:

<i>Domain</i>	<i>Definition</i>
Other-complete	For Other, distinguish those HH with all complete interviews (defined as ACTION = 10 (OUTCOME = 201)).
Other-partial	For Other, distinguish those HHs with at least one partial interview (defined as ACTION = 4 (OUTCOME = 203)).

In 2011 only, a Cancer domain was also used:

<i>Domain</i>	<i>Definition</i>
Cancer	At least one adult in HH has reported cancer (defined as AGE GE 18 AND (CANEV = 1 OR LAHCA12 = 1)).

Table A1. Sample selection details of MEPS from NHIS, 1996–2016 (Panels 1-21)

MEPS Year/ Panel	NHIS Quarters/ Panels	Sampling Domain	Household Eligible for Sampling	Sampling Rate	Household Sampled
1996/P1	Q2,3/P1,3	TOTAL	N/A		10,597
1997/P2	Q1,2,3/P1,3	TOTAL	14,706	0.428	6,300
		Adult ADL	478	1.000	478
		Child Limitation	601	1.000	601
		High Expenses	596	1.000	596
		Predicted Poor	2,064	0.600	1,238
		Other Limitation	324	0.600	194
		Age 65	2,157	0.300	647
		Other	8,486	0.300	2,546

MEPS Year/ Panel	NHIS Quarters/ Panels	Sampling Domain	Household Eligible for Sampling	Sampling Rate	Household Sampled
1998/P3	Q2/P1,3	TOTAL	5,166	1.000	5,166
1999/P4	Q1,2,3/P1	TOTAL	7,301	0.945	6,900
2000/P5	Q1,2,3/P1	TOTAL	7,263	0.741	5,380
2001/P6	Q1,2,3/P1,3	TOTAL	14,508	0.738	10,704
	Q1,2	-	9,338	0.750	7,004
	Q3	-	5,170	0.716	3,700
2002/P7	Q1,2,3/P1,3	TOTAL	14,510	0.560	8,132
	Q1,2	Asian/Predicted Poor	1,718	1.000	1,718
		Other	7,563	0.500	3,781
		Total	9,281	0.592	5,499
	Q3	Asian/Predicted Poor	953	1.000	953
		Other	4,276	0.393	1,680
		Total	5,229	0.504	2,633
	Total	Asian/Predicted Poor	2,671	1.000	2,671
		Other	11,839	0.461	5,461
	2003/P8	Q1,2,3/P1,3	TOTAL	13,628	0.616
Q1,2		Asian/Predicted Poor	1,623	1.000	1,623
		Other	7,395	0.500	3,698
		Total	9,018	0.590	5,321
Q3		Asian/Predicted Poor	825	1.000	825
		Other	3,785	0.595	2,254
		Total	4,610	0.668	3,079
Total		Asian/Predicted Poor	2,448	1.000	2,448
		Other	11,180	0.532	5,952
2004/P9		Q1,2,3/P1,3	TOTAL	13,618	0.634
	Q1,2	Asian/Predicted Poor	1,516	1.000	1,516
		Black	853	0.750	640
		Other	5,923	0.600	3,554
		Total	8,292	0.689	5,710
	Q3	Asian/Predicted Poor	1,050	1.000	1,050
		Black	541	0.500	271
		Other	3,735	0.431	1,609
		Total	5,326	0.550	2,930

MEPS Year/ Panel	NHIS Quarters/ Panels	Sampling Domain	Household Eligible for Sampling	Sampling Rate	Household Sampled
	Total	Asian/Predicted Poor	2,566	1.000	2,566
		Black	1,394	0.653	911
		Other	9,658	0.535	5,163
2005/P10	Q1,2,3/P1,3	TOTAL	13,218	0.646	8,546
	Q1,2	Asian/Predicted Poor	1,619	1.000	1,619
		Black	823	0.750	617
		Other	5,658	0.600	3,395
		Total	8,100	0.695	5,631
	Q3	Asian/Predicted Poor	956	1.000	956
		Black	564	0.750	423
		Other	3,598	0.427	1,536
		Total	5,118	0.569	2,915
	Total	Asian/Predicted Poor	2,575	1.000	2,575
		Black	1,387	0.750	1,040
		Other	9,256	0.533	4,931
	2006/P11	Q1,2,3/P1,3	TOTAL	14,224	.665
Q1,2		Asian/Predicted Poor	1,726	1.000	1,726
		Black	930	.750	698
		Other	6,404	.600	3,842
		Total	9,060	.692	6,266
Q3		Asian/Poor	959	1.000	959
		Black	544	.750	408
		Other	3,661	.500	1,831
		Total	5,164	.619	3,198
Total		Asian/Predicted Poor	2,685	1.000	2,685
		Black	1,474	.750	1,106
		Other	10,065	.564	5,673
2007/P12		Q1,2/P1,4	TOTAL	8,055	.909
	Q1	Asian/Predicted Poor	780	1.000	780
		Hispanic	505	.750	378
		Black	432	.750	324
		Other	2,002	.750	1,501
		Total	3,719	.802	2,983
	Q2	Asian/Predicted Poor	943	1.000	943
		Hispanic	592	1.000	592

MEPS Year/ Panel	NHIS Quarters/ Panels	Sampling Domain	Household Eligible for Sampling	Sampling Rate	Household Sampled	
		Black	560	1.000	560	
		Other	2,241	1.000	2,241	
		Total	4,336	1.000	4,336	
	Total	Asian/Predicted Poor	1,723	1.000	1,723	
		Hispanic	1,097	.884	970	
		Black	992	.891	884	
		Other	4,243	.882	3,742	
	2008/P13	Q1,2,3/P1,4	TOTAL	12,452	.779	9,703
Q1,2		Asian/Predicted Poor	1678	1.000	1678	
		Hispanic	1194	1.000	1194	
		Black	966	1.000	966	
		Other	4,157	.600	2,494	
		Total	7,995	.792	6,332	
Q3		Asian/Predicted Poor	954	1.000	954	
		Hispanic	661	1.000	661	
		Black	532	1.000	532	
		Other	2,310	.530	1,224	
		Total	4,457	.756	3,371	
Total		Asian/Predicted Poor	2,632	1.000	2,632	
		Hispanic	1,855	1.000	1,855	
		Black	1,498	1.000	1,498	
		Other	6,467	.5749	3,718	
2009/P14		Q1,2,3/P1,4	TOTAL	12,181	.796	9,700
		Q1,2	Asian	525	1.000	525
			Hispanic	1,571	.900	1,414
			Black	1,307	.900	1,176
			Other	4,561	.750	3,420
	Total		7,964	.821	6,535	
	Q3	Asian	309	1.000	309	
		Hispanic	815	.800	652	
		Black	712	.899	640	
		Other	2,381	.657	1,564	
		Total	4,217	.751	3,165	
	Total	Asian	834	1.000	834	

MEPS Year/ Panel	NHIS Quarters/ Panels	Sampling Domain	Household Eligible for Sampling	Sampling Rate	Household Sampled
		Hispanic	2,386	.866	2,066
		Black	2,019	.899	1,816
		Other	6,942	.718	4,984
2010/P15	Q1,2,3/P1,4	TOTAL	12,390	.707	8,750
	Q1,2	Asian	534	1.000	534
		Hispanic	1,662	.800	1,330
		Black	1,279	.900	1,151
		Other	4,574	.638	2,919
		Total	8,049	.737	5,934
	Q3	Asian	326	1.000	326
		Hispanic	917	.688	631
		Black	715	.775	554
		Other	2,383	.548	1,305
		Total	4,341	.649	2,816
	Total	Asian	860	1.000	860
		Hispanic	2,579	.760	1,961
		Black	1,994	.855	1,705
		Other	6,957	.609	4,224
	2011/P16	Q1,2,3/P1,4	TOTAL	12,067	.844
Q1,2		Cancer	595	1.000	595
		Asian	485	1.000	485
		Hispanic	1,516	1.000	1,516
		Black	1,209	1.000	1,209
		Other-complete	2,810	.850	2,389
		Other-partial	1,177	.504	593
		Total	7,792	.871	6,787
Q3		Cancer	287	1.000	287
		Asian	341	1.000	341
		Hispanic	870	1.000	870
		Black	685	1.000	685
		Other-complete	1,462	.660	965
	Other-partial	630	.389	245	
	Total	4,275	.794	3,393	

MEPS Year/ Panel	NHIS Quarters/ Panels	Sampling Domain	Household Eligible for Sampling	Sampling Rate	Household Sampled
	Total	Cancer	882	1.000	882
		Asian	826	1.000	826
		Hispanic	2386	1.000	2386
		Black	1894	1.000	1894
		Other-complete	4272	.785	3354
		Other-partial	1807	.464	838
2012/P17	Q1,2,3/P1,4	TOTAL	13,701	0.708	9,700
	Q1,2	Asian	695	1.000	695
		Hispanic	1,783	1.000	1,783
		Black	1,348	1.000	1,348
		Other-complete	941	0.400	376
		Other-partial	4,317	0.525	2,265
		Total	9,084	0.712	6,467
	Q3	Asian	380	1.000	380
		Hispanic	979	1.000	979
		Black	705	1.000	705
		Other-complete	444	0.400	178
		Other-partial	2,109	0.470	991
		Total	4,617	0.700	3,233
	Total	Asian	1,075	1.000	1,075
		Hispanic	2,762	1.000	2,762
		Black	2,053	1.000	2,053
		Other-complete	1,385	0.400	554
		Other-partial	6,426	0.507	3,256
2013/P18	Q1,2,3/P1,4	TOTAL	12,565	0.772	9,700
	Q1,2	Asian	656	1.000	656
		Hispanic	1,709	1.000	1,709
		Black	1,339	1.000	1,339
		Other-complete	3,669	0.508	1,864
		Other-partial	1,086	0.350	380
		Total	8,459	0.703	5,948
	Q3	Asian	362	1.000	362
		Hispanic	932	1.000	932
		Black	651	1.000	651

MEPS Year/ Panel	NHIS Quarters/ Panels	Sampling Domain	Household Eligible for Sampling	Sampling Rate	Household Sampled	
		Other-complete	1,673	0.899	1,504	
		Other-partial	488	0.620	303	
		Total	4,106	0.914	3,752	
	Total	Asian	1,018	1.000	1,018	
		Hispanic	2,641	1.000	2,641	
		Black	1,990	1.000	1,990	
		Other-complete	5,342	0.631	3,368	
		Other-partial	1,574	0.434	683	
	2014/P19	Q1,2,3/P1,4	TOTAL	12,313	0.788	9,700
		Q1,2	Asian	616	1.000	616
			Hispanic	1,665	1.000	1,665
Black			1,287	1.000	1,287	
Other-complete			3,649	0.690	2,519	
Other-partial			864	0.440	380	
Total			8,081	1.000	6,467	
Q3		Asian	360	1.000	360	
		Hispanic	963	1.000	963	
		Black	715	1.000	715	
		Other-complete	1,711	0.592	1,012	
		Other-partial	483	0.379	183	
		Total	4,232	0.764	3,233	
Total		Asian	976	1.000	976	
		Hispanic	2,628	1.000	2,628	
		Black	2,002	1.000	2,002	
		Other-complete	5,360	0.659	3,531	
		Other-partial	1,347	0.418	563	
2015/P20		Q1,2,3/P1,4	TOTAL	12,109	0.876	10,610
		Q1,2	Asian	629	1.000	629
			Hispanic	1,726	1.000	1,726
			Black	1,215	1.000	1,215
	Other-complete		3,419	0.868	2,969	
	Other-partial		989	0.540	534	
	Total		7,978	0.887	7,073	
	Q3	Asian	325	1.000	325	

MEPS Year/ Panel	NHIS Quarters/ Panels	Sampling Domain	Household Eligible for Sampling	Sampling Rate	Household Sampled
		Hispanic	980	1.000	980
		Black	666	1.000	666
		Other-complete	1,698	0.786	1,335
		Other-partial	462	0.500	231
		Total	4,131	0.856	3,537
	Total	Asian	954	1.000	954
		Hispanic	2,706	1.000	2,706
		Black	1,881	1.000	1,881
		Other-complete	5,117	0.841	4,304
		Other-partial	1,451	0.527	765
2016/P21	Q1,2,3/P1,4	TOTAL	11,336	0.856	9,700
	Q1,2	Asian	604	1.000	604
		Hispanic	1,639	1.000	1,639
		Black	1,202	1.000	1,202
		Other-complete	3,228	0.787	2,540
		Other-partial	1,004	0.480	482
		Total	7,677	0.842	6,467
	Q3	Asian	359	1.000	359
		Hispanic	879	1.000	879
		Black	599	1.000	599
		Other-complete	1,323	0.866	1,145
		Other-partial	499	0.503	251
		Total	3,659	0.884	3,233
	Total	Asian	963	1.000	963
		Hispanic	2,518	1.000	2,518
Black		1,801	1.000	1,801	
Other-complete		4,551	0.810	3,685	
Other-partial		1,503	0.488	733	

Table A2. Number of completed person-level interviews by age, sex, race/ethnicity, region, and MSA status in MEPS Full-Year Files: MEPS-HC 1996–2006

Year	1996	1997	1998	1999 ¹	2000	2001	2002	2003	2004	2005	2006
Total	21,571	32,636	22,953	23,565	23,839	32,122	37,418	32,681	32,737	32,320	32,577
Age											
<1	321	406	270	266	291	383	455	431	426	424	417
1-17	5,965	9,330	6,569	6,551	6,595	8,774	10,599	9,512	9,353	9,217	9,161
18-24	1,884	2,919	2,154	2,095	2,119	3,010	3,462	3,080	3,072	3,041	2,994
25-44	6,478	9,332	6,412	6,727	6,680	8,869	10,273	8,877	8,819	8,559	8,317
45-64	4,374	6,661	4,753	5,107	5,244	7,228	8,296	7,053	7,303	7,362	7,749
65+	2,549	3,988	2,795	2,819	2,910	3,858	4,333	3,728	3,764	3,717	3,939
Sex											
Male	10,289	15,443	10,859	11,287	11,445	15,369	17,796	15,413	15,439	15,251	15,370
Female	11,282	17,193	12,094	12,278	12,394	16,753	19,622	17,268	17,298	17,069	17,207
Race/ethnicity											
Hispanic	4,638	7,542	5,585	5,852	5,936	7,637	9,427	8,866	9,022	8,990	8,906
Non-Hispanic	16,933	25,094	17,368	17,713	17,903	24,485	27,991	23,815	23,715	23,330	23,671
Black	2,907	4,815	3,430	3,239	3,471	4,699	5,570	5,094	4,991	5,260	5,608
Asian	582	829	597	635	602	987	1,304	1,349	1,311	1,227	1,243
Other	13,444	19,450	13,341	13,839	13,830	18,799	21,117	17,372	17,413	16,843	16,820
Region											
Northeast	4,275	6,278	4,159	4,031	3,746	5,063	5,840	4,843	4,912	4,734	4,673
Midwest	4,668	6,834	4,537	4,657	4,951	6,679	7,377	6,365	6,224	6,154	6,370
South	7,494	11,446	8,340	8,764	8,901	12,003	14,212	12,704	13,130	12,656	12,341
West	5,134	8,078	5,917	6,113	6,241	8,377	9,989	8,769	8,471	8,776	9,193

Table A3. Number of completed person-level interviews by age, sex, race/ethnicity, region, and MSA status in MEPS Full-Year Files: MEPS-HC 2007–2016

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total	29,370	31,262	34,920	31,228	33,622	37,182	35,068	33,162	33,893	33,259
Age										
<1	375	492	490	420	425	485	453	405	371	392
1-17	8,079	8,642	9,560	8,290	8,961	9,935	9,447	8,870	8,831	8,458
18-24	2,692	3,073	3,433	3,010	3,265	3,679	3,460	3,197	3,119	3,005
25-44	7,535	8,278	9,154	8,093	8,835	9,827	9,291	8,791	8,925	8,525
45-64	7,119	7,374	8,399	7,695	8,080	8,937	8,430	7,897	8,275	8,233
65+	3,570	3,403	3,884	3,720	4,056	4,319	3,987	4,002	4,372	4,646
Sex										
Male	14,003	14,946	16,634	14,881	16,068	17,822	16,638	15,790	16,268	15,835
Female	15,367	16,316	18,286	16,347	17,554	19,360	18,430	17,372	17,625	17,424
Race/ethnicity										
Hispanic	7,659	8,863	10,112	8,511	9,705	11,862	11,539	10,649	11,068	10,843
Non-Hispanic	21,711	22,399	24,808	22,717	23,917	25,320	23,529	22,513	22,825	22,416
Black	4,953	6,056	7,004	6,106	6,758	7,589	7,312	6,968	6,551	6,082
Asian	1,400	1,929	2,295	2,206	2,301	2,653	2,630	2,369	2,464	2,452
Other	15,358	14,414	15,509	14,405	14,858	15,078	13,587	13,176	13,810	13,882
Region										
Northeast	4,384	4,810	5,182	4,757	5,319	6,052	5,838	5,133	5,101	5,262
Midwest	5,956	6,174	6,916	6,402	6,655	6,817	6,206	5,942	6,239	6,290
South	11,127	11,809	13,227	11,688	12,764	14,004	12,955	12,519	12,994	12,664
West	7,903	8,469	9,595	8,381	8,884	10,309	10,069	9,568	9,559	9,043

Appendix B

Calculation of Response Rates in MEPS

The general approach for the calculation of MEPS response rates, along with an illustrative example, is provided in this section. In particular, response rates for annual 2016 calendar year data are discussed. Because of the linkage of the NHIS and the MEPS, the response rate for MEPS is a combination of the response rate for the NHIS and the MEPS round-specific response rates. Due to the overlapping panel design for the production of annual estimates, the calculation of the annual response rates for MEPS likewise comprises the two overlapping panel-specific response rates. Further, the panel-specific response rates get weighted by their respective sample sizes.

To understand the calculation of MEPS response rates, some key features related to MEPS data collection are first discussed. When an RU is visited for a round of data collection, any changes in RU membership are identified. Such changes include RU members who have moved to another location in the U.S., thus creating a new RU to be interviewed for MEPS, as well as student RUs. Thus, the number of RUs eligible for MEPS interviewing in a given round can only be determined after data collection is fully completed. The ratio of the number of RUs completing the MEPS interview in a given round to the number of RUs characterized as eligible to complete the interview for that round represents the “conditional” round-specific response rate expressed as a proportion. It is “conditional” in that it pertains to the set of RUs characterized as eligible for MEPS for that round, and thus is “conditioned” on prior participation rather than representing the overall response rate through that round. For example, in Table B1, for Panel 20, Round 2, the ratio of 7,991 (Row G) to 8,554 (Row F) multiplied by 100 represents the percentage response rate for Round 2 (93.42 percent when computed), conditioned on the set of RUs characterized as eligible for MEPS for Round 2. Taking the product of the response rate of the NHIS sample designated for use in MEPS (Row A) and the product of the response rates (ratio of the number of completed interviews to the number eligible) for each consecutive set of MEPS rounds, beginning with Round 1, produces the overall response rate through the last MEPS round specified.

An example of a response rate calculation for a full-year MEPS is as follows: To produce annual health care and expenditure estimates for calendar year 2016, data from Panel 20 and Panel 21 are combined. More specifically, data collected covering calendar year 2016 for Rounds 3 through 5 of Panel 20 are combined with corresponding 2016 data from the first three rounds of Panel 21 to produce calendar year 2016 estimates. The overall response rate for the

combined sample in Panels 20 and 21 for 2016 is obtained by computing the product of the relative responding sample sizes and the corresponding overall panel response rates and then summing the two products. Details of the calculations as carried out for the 2016 MEPS annual response rate are provided below.

Table B1. Example sample size and final response rates - Full Year (Panel 20, Rounds 1–3 combined with Panel 21, Rounds 3–5): MEPS 2016

Calculation	Panel 20	Panel 21
A. Percentage of NHIS households designated for use in MEPS (those initially characterized as responding)	75.1%	71.2%
B. Number of households sampled from the NHIS	10,610	9,700
C. Number of households sampled from the NHIS and eligible and fielded for MEPS	10,571	9,658
D. Round 1 – Number of RUs ¹ eligible for interviewing	11,283	10,280
E. Round 1 – Number of RUs with completed interviews	8,287	7,643
F. Round 2 – Number of RUs eligible for interviewing	8,554	7,870
G. Round 2 – Number of RUs with completed interviews	7,991	7,319
H. Round 3 – Number of RUs eligible for interviewing	7,743	7,035
I. Round 3 – Number of RUs with completed interviews	7,743	7,035
J. Round 4 – Number of RUs eligible for interviewing	7,877	NA
K. Round 4 – Number of RUs with completed interviews	7,621	NA
L. Round 5 – Number of RUs eligible for interviewing	7,698	NA
M. Round 5 – Number of RUs with completed interviews	7,421	NA
Individual panel response rates: P20: $A \times (E/D) \times (G/F) \times (I/H) \times (K/J) \times (M/L)$ P21: $A \times (E/D) \times (G/F) \times (I/H)$	45.7% (through Round 5)	46.3% (through Round 3)
Overall combined response rate: $0.51 \times \text{P20 response rate} +$ $0.49 \times \text{P21 response rate}$	46.0%	

¹RU: reporting unit