

# **MEPS HC-220B: 2020 Dental Visits**

## **August 2022**

**Due to the COVID-19 pandemic, changes were made to the 2020 MEPS data collection that analysts should keep in mind when doing trend analysis and pooling years of data. 1) The MEPS moved primarily to a phone rather than in-person survey. 2) Panels 23 and 24 were extended to nine rounds (four years) of data collection as opposed to the historical five rounds (two years). Because of the unforeseeable nature of the pandemic, data collection for 2020 included Round 5 interviews for Panel 23 that were fielded under the assumption that that interview would be the panel's last interview. Researchers using variables related to the first interview of the calendar year should read the documentation for their specific variables to understand the sources of the values for Panel 23.**

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## A. Data Use Agreement

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Individual identifiers have been removed from the micro-data contained in these files. Nevertheless, under Sections 308 (d) and 903 (c) of the Public Health Service Act (42 U.S.C. 242m and 42 U.S.C. 299 a-1), data collected by the Agency for Healthcare Research and Quality (AHRQ) and/or the National Center for Health Statistics (NCHS) may not be used for any purpose other than for the purpose for which they were supplied; any effort to determine the identity of any reported cases is prohibited by law.

Therefore in accordance with the above referenced Federal Statute, it is understood that:

1. No one is to use the data in this data set in any way except for statistical reporting and analysis; and
2. If the identity of any person or establishment should be discovered inadvertently, then (a) no use will be made of this knowledge, (b) the Director Office of Management AHRQ will be advised of this incident, (c) the information that would identify any individual or establishment will be safeguarded or destroyed, as requested by AHRQ, and (d) no one else will be informed of the discovered identity; and
3. No one will attempt to link this data set with individually identifiable records from any data sets other than the Medical Expenditure Panel Survey or the National Health Interview Survey. Furthermore, linkage of the Medical Expenditure Panel Survey and the National Health Interview Survey may not occur outside the AHRQ Data Center, NCHS Research Data Center (RDC) or the U.S. Census RDC network.

By using these data you signify your agreement to comply with the above stated statutorily based requirements with the knowledge that deliberately making a false statement in any matter within the jurisdiction of any department or agency of the Federal Government violates Title 18 part 1 Chapter 47 Section 1001 and is punishable by a fine of up to \$10,000 or up to 5 years in prison.

The Agency for Healthcare Research and Quality requests that users cite AHRQ and the Medical Expenditure Panel Survey as the data source in any publications or research based upon these data.

## **B. Background**

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### **1.0 Household Component**

The Medical Expenditure Panel Survey (MEPS) provides nationally representative estimates of health care use, expenditures, sources of payment, and health insurance coverage for the U.S. civilian noninstitutionalized population. The MEPS Household Component (HC) also provides estimates of respondents' health status, demographic and socio-economic characteristics, employment, access to care, and satisfaction with health care. Estimates can be produced for individuals, families, and selected population subgroups. The panel design of the survey, which includes 5 Rounds of interviews covering 2 full calendar years (and two additional rounds in 2020 covering a third year to compensate for the smaller number of completed interviews in Panel 25), provides data for examining person-level changes in selected variables such as expenditures, health insurance coverage, and health status. Using computer assisted personal interviewing (CAPI) technology, information about each household member is collected, and the survey builds on this information from interview to interview. All data for a sampled household are reported by a single household respondent.

The MEPS HC was initiated in 1996. Each year a new panel of sample households is selected. Because the data collected are comparable to those from earlier medical expenditure surveys conducted in 1977 and 1987, it is possible to analyze long-term trends. Each annual MEPS HC sample size is about 15,000 households. Data can be analyzed at either the person or event level. Data must be weighted to produce national estimates.

The set of households selected for each panel of the MEPS HC is a subsample of households participating in the previous year's National Health Interview Survey (NHIS) conducted by the National Center for Health Statistics (NCHS). The NHIS sampling frame provides a nationally representative sample of the U.S. civilian noninstitutionalized population. In 2006, the NHIS implemented a new sample design, which included Asian persons in addition to households with Black and Hispanic persons in the oversampling of minority populations. NHIS introduced a new sample design in 2016 that discontinued oversampling of these minority groups.

### **2.0 Medical Provider Component**

Upon completion of the household CAPI interview and obtaining permission from the household survey respondents, a sample of medical providers are contacted by telephone to obtain information that household respondents cannot accurately provide. This part of the MEPS is called the Medical Provider Component (MPC) and information is collected on dates of visits, diagnosis and procedure codes, charges and payments. The Pharmacy Component (PC), a subcomponent of the MPC, does not collect charges or diagnosis and procedure codes but does collect drug detail information, including National Drug Code (NDC) and medicine name, as well as amounts of payment. The MPC is not designed to yield national estimates. It is primarily used as an imputation source to supplement/replace household reported expenditure information.

### **3.0 Survey Management and Data Collection**

MEPS HC and MPC data are collected under the authority of the Public Health Service Act. Data are collected under contract with Westat, Inc. (MEPS HC) and Research Triangle Institute (MEPS MPC). Data sets and summary statistics are edited and published in accordance with the confidentiality provisions of the Public Health Service Act and the Privacy Act. The National Center for Health Statistics (NCHS) provides consultation and technical assistance.

As soon as data collection and editing are completed, the MEPS survey data are released to the public in staged releases of micro data files and tables via the [MEPS website](#).

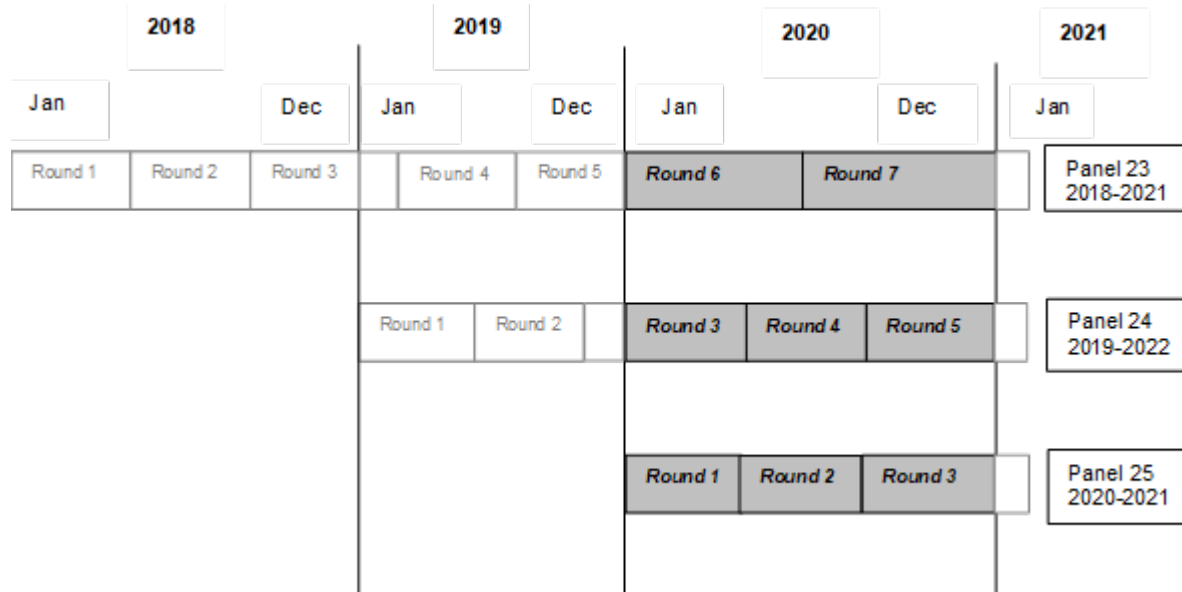
Additional information on MEPS is available from the MEPS project manager or the MEPS public use data manager at the Center for Financing, Access, and Cost Trends, Agency for Healthcare Research and Quality, 5600 Fishers Lane, Rockville, MD 20857 (301-427-1406).

## C. Technical and Programming Information

### 1.0 General Information

This documentation describes one in a series of public use event files from the 2020 Medical Expenditure Panel Survey (MEPS) Household Component (HC). Released as an ASCII data file (with related SAS, SPSS, R, and Stata programming statements and data user information) and a SAS data set, a SAS transport file, Stata data set, and an Excel file, the 2020 Dental public use file provides detailed information on dental events for a nationally representative sample of the civilian noninstitutionalized population of the United States. Data from the Dental file can be used to make estimates of dental event utilization and expenditures for calendar year 2020. This file contains 58 variables and has a logical record length of 253 with an additional 2-byte carriage return/line feed at the end of each record. As illustrated below, this file consists of MEPS survey data obtained in Round 6 and the 2020 portion of Round 7 for Panel 23; the 2020 portion of Rounds 3 and 5, and all of Round 4 for Panel 24; and Rounds 1, 2, and the 2020 portion of Round 3 of Panel 25 (i.e., the rounds for the MEPS panels covering calendar year 2020).

Full year (FY) 2020 is the first data year to include three panels of data; Panel 23 was extended to include Rounds 6 and 7.



Each record on this event file represents a unique dental event; that is, a dental event reported by the household respondent. Counts of dental event utilization are based entirely on household reports. Dental events were not included in the Medical Provider Component (MPC); therefore, all expenditure and payment data on the Dental event file are reported by the household.

Data from this event file can be merged with other 2020 MEPS HC data files for the purpose of appending person-level data such as demographic characteristics or health insurance coverage to each dental record.

This file can also be used to construct summary variables of expenditures, source of payment, and related aspects of the dental event. Aggregate annual person-level information on the use of dental events and other health services is provided on the MEPS 2020 Full Year Consolidated Data File where each record represents a MEPS sampled person.

This document offers a brief overview of the types and levels of data provided, and the content and structure of the file and the codebook. It contains the following sections:

- Data File Information
- Survey Sample Information
- Strategies for Estimation
- Merging/Linking MEPS Data Files
- References
- Variable - Source Crosswalk

For more information on the MEPS HC sample design, see Chowdhury et al (2019). A copy of the MEPS HC survey instrument used to collect the information on the Dental file is available on the [MEPS website](#).

## **2.0 Data File Information**

The 2020 Dental public use data set consists of one event-level data file. The file contains characteristics associated with the dental event and imputed expenditure data.

The 2020 Dental public use data set contains 21,363 dental event records; of these records, 21,115 are associated with persons having a positive person-level weight (PERWT20F). This file includes dental event (DV) records for all household members who resided in eligible responding households and reported at least one dental event. Each record represents one household-reported dental event that occurred during calendar year 2020. Dental visits known to have occurred before January 1, 2020 and after December 31, 2020 are not included on this file. Some household members may have multiple dental events and thus will be represented in multiple records on this file. Other household members may have had reported no dental events and thus will have no records on this file. These data were collected during Round 6 and the 2020 Portion of Round 7 for Panel 23; the 2020 portion of Rounds 3 and 5, and all of Round 4



for Panel 24; as well as Rounds 1, 2, and the 2020 portion of Round 3 for Panel 25 of the MEPS HC. The persons represented on this file had to meet either a) or b) below:

- a) Be classified as a key in-scope person who responded for his or her entire period of 2020 eligibility (i.e., persons with a positive 2020 full-year person-level weight ( $PERWT20F > 0$ )), or
- b) Be an eligible member of a family all of whose key in-scope members have a positive person-level weight ( $PERWT20F > 0$ ). (Such a family consists of all persons with the same value for FAMIDYR.) That is, the person must have a positive full-year family-level weight ( $FAMWT20F > 0$ ). Note that FAMIDYR and FAMWT20F are variables on the 2020 Full Year Consolidated Data File.

Persons with no dental events for 2020 are not included on this event-level DV file but are represented on the person-level 2020 Full Year Population Characteristics file.

Each dental event record includes the following: date of the dental event; type of provider seen; procedure(s) associated with the dental event; flat fee information; imputed sources of payment; total payment and total charge of the dental event expenditure; and a full-year person-level weight.

To append person-level information such as demographic or health insurance coverage to each event record, data from this file can be merged with 2020 MEPS HC person-level data (e.g. Full Year Consolidated or Full Year Population Characteristics files) using the person identifier, DUPERSID. Dental events can also be linked to the MEPS 2020 Prescribed Medicines File. Please see Section 5.0 or the 2020 Appendix for details on how to merge MEPS data files.

## 2.1 Codebook Structure

For most variables on the Dental event file, both weighted and unweighted frequencies are provided in the accompanying codebook. The exceptions to this are weight variables and variance estimation variables. Only unweighted frequencies of these variables are included in the accompanying codebook file. See the Weights Variables list in Section D, Variable-Source Crosswalk.

The codebook and data file sequence list variables in the following order:

- Unique person identifier
- Unique dental event identifier
- Dental characteristic variables
- Imputed expenditure variables
- Weight and variance estimation variables

Note that the person identifier is unique within this data year.

## 2.2 Reserved Codes

The following reserved code values are used:

| Value                  | Definition  |
|------------------------|---|
| -1 INAPPLICABLE        | Question was not asked due to skip pattern  |
| -7 REFUSED             | Question was asked and respondent refused to answer question                                      |
| -8 DK                  | Question was asked and respondent did not know answer or the information could not be ascertained |
| -15 CANNOT BE COMPUTED | Value cannot be derived from data   |

The value -15 (CANNOT BE COMPUTED) is assigned to MEPS constructed variables in cases where there is not enough information from the MEPS instrument to calculate the constructed variables. “Not enough information” is often the result of skip patterns in the data or from missing information resulting from MEPS responses of -7 (REFUSED) or -8 (DK). Note that reserved code -8 includes cases where the information from the question was “not ascertained” or where the respondent chose “don’t know”.

Generally, values of -1, -7, -8, and -15 for non-expenditure variables have not been edited on this file. The values of -1 and -15 can be edited by the data users/analysts by following the skip patterns in the [HC survey questionnaire](#) located on the MEPS website.

## 2.3 Codebook Format

The codebook describes an ASCII data set (although the data are also being provided in a SAS data set, a SAS transport file, a Stata data set, and an Excel file).

The following codebook items are provided for each variable:

| Identifier  | Description   |
|-------------|---|
| Name        | Variable name   |
| Description | Variable descriptor   |
| Format      | Number of bytes   |
| Type        | Type of data: numeric (indicated by NUM) or character (indicated by CHAR) |
| Start       | Beginning column position of variable in record                           |
| End         | Ending column position of variable in record                              |

## 2.4 Variable Source and Naming Conventions

In general, variable names reflect the content of the variable. All imputed/edited variables end with an “X”.

As variable collection, universe, or categories are altered, the variable name will be appended with “\_Myy” to indicate in which year the alterations took place. Details about these alterations can be found throughout this document.

### 2.4.1 Variable - Source Crosswalk

Variables were derived from the HC survey questionnaire or from the CAPI. The source of each variable is identified in Section D, Variable-Source Crosswalk in one of four ways:

1. Variables derived from CAPI or assigned in sampling are so indicated as “CAPI derived” or “Assigned in sampling,” respectively;
2. Variables which come from one or more specific questions have those questionnaire sections and question numbers indicated in the “Source” column; questionnaire sections are identified as:
  - FF - Flat Fee section
  - DN - Dental Event section
  - CP - Charge Payment section
3. Variables constructed from multiple questions using complex algorithms are labeled “Constructed” in the “Source” column; and
4. Variables that have been edited or imputed are so indicated.

### 2.4.2 Expenditure and Source of Payment Variables

The names of the expenditure and source of payment variables follow a standard convention, are seven characters in length, and end in an “X” indicating edited/imputed. Please note that imputed means that a series of logical edits, as well as an imputation process to account for missing data, have been performed on the variable.

The total sum of payments and 10 source of payment variables are named in the following way:

The first two characters indicate the type of event:

IP - inpatient stay

HH - home health visit

ER - emergency room visit

OM - other medical equipment

OB - office-based visit

DV - dental visit

OP - outpatient visit

RX - prescribed medicine

In the case of the source of payment variables, the third and fourth characters indicate:

SF - self or family

OF - other federal government

MR - Medicare

SL - state/local government

MD - Medicaid

WC - Workers' Compensation

PV - private insurance

OT - other insurance

VA - Veterans  
Administration/CHAMPVA

TR - TRICARE

XP - sum of payments

In addition, the total charge variable is indicated by TC in the variable name.

The fifth and sixth characters indicate the year (20). The seventh character being "X" indicates the variable is edited/imputed.

For example, DVSF20X is the edited/imputed amount paid by self or family for 2020 dental expenditures.

## **2.5 File Contents**

### **2.5.1 Survey Administration Variables**

#### ***Person Identifiers (DUID, PID, DUPERSID)***

The definitions of Dwelling Units (DUs) in the MEPS Household Survey are generally consistent with the definitions employed for the National Health Interview Survey (NHIS). The dwelling unit ID (DUID) is a seven-digit number consisting of a 2-digit panel number followed by a five-digit random number assigned after the case was sampled for MEPS. A three-digit person number (PID) uniquely identifies each person within the DU. The ten-character variable DUPERSID uniquely identifies each person represented on the file and is the combination of the variables DUID and PID. IDs begin with the 2-digit panel number.

For detailed information on dwelling units and families, please refer to the documentation for the 2020 Full Year Population Characteristics file.

### ***Record Identifiers (EVNTIDX, FFEEIDX)***

EVNTIDX uniquely identifies each dental event (i.e., each record on the Dental file) and is the variable required to link dental events to data files containing details on prescribed medicines (MEPS 2020 Prescribed Medicines File). EVNTIDX begins with the 2-digit panel number and ends with the 2-digit event type number. For details on linking see Section 5.0 or the MEPS 2020 Appendix File, HC-220I.

FFEEIDX is a constructed variable that uniquely identifies a flat fee group, that is, all events that were part of a flat fee payment. For example, a charge for orthodontia is typically covered in a flat fee arrangement where all visits are covered under one flat fee dollar amount. These events would have the same value for FFEEIDX. FFEEIDX identifies a flat fee payment that was identified using information from the Household Component.

### ***Round Indicator (EVENTRN)***

EVENTRN indicates the round in which the dental event was reported. Please note: Rounds 6 and 7 (partial) are associated with MEPS survey data collected from Panel 23. Likewise, Rounds 3 (partial), 4, and 5 (partial) are associated with data collected from Panel 24, and Rounds 1, 2, and 3 (partial) are associated with data collected from Panel 25.

### ***Panel Indicator (PANEL)***

PANEL is a constructed variable used to specify the panel number for the person. PANEL will indicate either Panel 23, Panel 24, or Panel 25 for each person on the file. Panel 23 is the panel that started in 2018, Panel 24 is the panel that started in 2019, and Panel 25 is the panel that started in 2020.

## **2.5.2 Dental Event Variables**

This file contains variables describing dental events reported by household respondents in the Dental section of the MEPS HC survey questionnaire.

### ***Date of Visit (DVDATEYR - DVDATEMM)***

There are variables that indicate the month and year a dental event occurred (DVDATEMM and DVDATEYR, respectively). These variables have not been edited or imputed.

### ***Type of Provider Seen (GENDENT\_M18 - DENTYPE\_M18)***

Respondents were asked about the type of provider seen during the dental visit (e.g., general dentist, pediatric dentist, dental hygienist, or specialist). More than one type of provider may have been identified on an event record.

## ***Treatment, Procedures, and Services (EXAMINE\_M18 - ORTHDONT\_M18)***

Respondents were asked about the types of services or treatments received during the visit (EXAMINE\_M18 - ORTHDONT\_M18), such as root canal or x-rays. More than one type of service or treatment may have been identified on an event record. Some procedures or services identified in DENTOTHX as “Other specify dental procedures edited” have been edited to appropriate procedure and service categories. While the unedited versions of these variables are included in the dental event file every year, an edited version of a particular variable is included only if editing was done for that category. Starting in FY 2015, DENTOTHR was dropped from the file, but the edited version of this variable (DENTOTHX, “Other specify dental procedures edited”) is still included. Please note that the crosswalk in this document lists all possible edited procedure and service category variables; the edited variables in the data file will differ by year.

### **2.5.3 Flat Fee Variables (FFEEIDX, FFDVTYPE, FFBEF20, FFTOT21)**

#### ***Definition of Flat Fee Payments***

A flat fee is the fixed dollar amount a person is charged for a package of services provided during a defined period of time. Examples would be an orthodontist’s fee, which covers multiple visits; or a dental surgeon’s fee, which covers surgical procedure and post-surgical care. A flat fee group is the set of medical services that are covered under the same flat fee payment. The flat fee groups represented on the dental file include flat fee groups where at least one of the health care events, as reported by the HC respondent, occurred during 2020. By definition, a flat fee group can span multiple years. Furthermore, a single person can have multiple flat fee groups.

#### ***Flat Fee Variable Descriptions***

##### **Flat Fee ID (FFEEIDX)**

As noted in “Record Identifiers,” the variable FFEEIDX uniquely identifies all events that are part of the same flat fee group for a person. On any 2020 MEPS event file, every event that is part of a specific flat fee group will have the same value for FFEEIDX. Note that prescribed medicine and home health events are never included in a flat fee group and none of the flat fee variables is on those event files.

##### **Flat Fee Type (FFDVTYPE)**

FFDVTYPE indicates whether the 2020 dental event is the “stem” or “leaf” of a flat fee group. A stem (records with FFDVTYPE = 1) is the initial dental service (event) which is followed by other dental events that are covered under the same flat fee payment. The leaves of the flat fee group (records with FFDVTYPE = 2) are those dental events that are tied back to the initial medical event (the stem) in the flat fee group. These “leaf” records have their expenditure variables set to zero. For the dental visits that are not part of a flat fee payment, the FFDVTYPE is set to -1, “INAPPLICABLE”.

### **Counts of Flat Fee Events that Cross Years (FFBEF20, FFTOT21)**

As described in "Definition of Flat Fee Payments," a flat fee payment covers multiple events and the multiple events could span multiple years. For situations where a 2020 dental visit is part of a group of events, and some of the events occurred before or after 2020, counts of the known events are provided on the dental record. Variables that indicate events occurring before or after 2020 are the following:

FFBEF20 - indicates total number of pre-2020 events in the same flat fee group as the 2020 dental event. This count would not include 2020 dental events.

FFTOT21 - indicates the number of 2021 medical events expected to be in the same flat fee group as the 2020 dental event record.

If there are no 2019 events on the file, FFBEF20 will be omitted. Likewise, if there are no 2021 events on the file, FFTOT21 will be omitted. If there are no flat fee data related to the records in this file, FFEEIDX and FFDVTYPE will be omitted as well. Please note that the crosswalk in this document lists all possible flat fee variables.

### ***Caveats of Flat Fee Groups***

Data users/analysts should note that flat fee payments are common on the dental file. There are 3,753 dental events that are identified as being part of a flat fee payment group. In general, every flat fee group should have an initial visit (stem) and at least one subsequent visit (leaf). There are some situations where this is not true. For some of these flat fee groups, the initial visit reported occurred in 2020, but the remaining visits that were part of this flat fee group occurred in 2021. In this case, the 2020 flat fee group represented on this file would consist of one event (the stem). The 2021 "leaf" events that are part of this flat fee group are not represented on the file. Similarly, the household respondent may have reported a flat fee group where the initial visit began in 2019 but subsequent visits occurred during 2020. In this case, the initial visit would not be represented on the file. This 2020 flat fee group would then only consist of one or more leaf records and no stem. Please note that the crosswalk in this document lists all possible flat fee variables.

### **2.5.4 Condition Codes**

Conditions data are not collected for dental events; therefore, this file cannot be linked to the Conditions File.

### **2.5.5 Expenditure Data**

#### ***Definition of Expenditures***

Expenditures on this file refer to what is paid for dental services. More specifically, expenditures in MEPS are defined as the sum of payments for care received, including out-of-pocket

payments and payments made by private insurance, Medicaid, Medicare, and other sources. The definition of expenditures used in MEPS differs slightly from its predecessors, the 1987 NMES and 1977 NMCES surveys, where “charges” rather than sum of payments were used to measure expenditures. This change was adopted because charges became a less appropriate proxy for medical expenditures during the 1990s due to the increasingly common practice of discounting. Although measuring expenditures as the sum of payments incorporates discounts in the MEPS expenditure estimates, the estimates do not incorporate any payment not directly tied to specific medical care visits, such as bonuses or retrospective payment adjustments paid by third party payers. Another general change from the two prior surveys is that charges associated with uncollected liability, bad debt, and charitable care (unless provided by a public clinic or hospital) are not counted as expenditures because there are no payments associated with those classifications. While charge data are provided on this file, data users/analysts should use caution when working with these data because a charge does not typically represent actual dollars exchanged for services or the resource costs of those services, nor are they directly comparable to the resource costs of those services, nor are they directly comparable to the expenditures defined in the 1987 NMES. For details on expenditure definitions, please refer to the following, “Informing American Health Care Policy” (Monheit et al., 1999). AHRQ has developed factors to apply to the 1987 NMES expenditure data to facilitate longitudinal analysis. These factors can be accessed via the CFACT data center. For more information see the [Data Center section of the MEPS website](#). If examining trends in MEPS expenditures, please refer to Section 3.5 for more information.

### ***Data Editing and Imputation Methodologies of Expenditure Variables***

The general methodology used for editing and imputing expenditure data is described below. The MPC did not include either the dental events or other medical expenditures (such as glasses, contact lenses, and hearing devices). Therefore, although the general procedures remain the same for dental and other medical expenditures, editing and imputation methodologies were applied only to household-reported data. Please see below for details on the differences between these editing/imputation methodologies. Separate imputations were performed for flat fee and simple events as well.

#### **General Data Editing Methodology**

Logical edits were used to resolve internal inconsistencies and other problems in the HC survey-reported data. The edits were designed to preserve partial payment data from households and providers, and to identify actual and potential sources of payment for each household-reported event. In general, these edits accounted for outliers, copayments or charges reported as total payments, and reimbursed amounts that were reported as out-of-pocket payments. In addition, edits were implemented to correct for misclassifications between Medicare and Medicaid, and between Medicare HMOs and private HMOs as payment sources. These edits produced a complete vector of expenditures for some events, and provided the starting point for imputing missing expenditures in the remaining events.

#### **Imputation Methodologies**

The predictive mean matching imputation method was used to impute missing expenditures. This procedure uses regression models (based on events with completely reported expenditure data) to



predict total expenses for each event. Then, for each event with missing payment information, a donor event with the closest predicted payment with the same pattern of expected payment sources as the event with missing payment was used to impute the missing payment value. The imputations for the flat fee events were carried out separately from the simple events.

A weighted sequential hot-deck procedure was used to impute the missing total charges. This procedure uses survey data from respondents to replace missing data while taking into account the persons' weighted distribution in the imputation process.

### **Dental Data Editing and Imputation**

Expenditures on visits to dentists were developed in a sequence of logical edits and imputations. The household edits were used to correct obvious errors in the reporting of expenditures, and to identify actual and potential sources of payments. Some of the edits were global (i.e., applied to all events); others were hierarchical and mutually exclusive. One of the more important edits separated flat fee events from simple events. This edit was necessary because groups of events covered by a flat fee (i.e., a flat fee bundle) were edited and imputed separately from individual events each covered by a single charge (i.e., simple events). Dental services were imputed as flat fee events if the charges covered a package of health care services (e.g., orthodontia), and all of the services were part of the same event type (i.e., a pure bundle). If a bundle contained more than one type of event, the services were treated as simple events in the imputations (See Section 2.5.3 for more detail on the definition and imputation of events in flat fee bundles.)

Logical edits were also used to sort each event into a specific category for the imputations. Events with complete expenditures were flagged as potential donors for the predictive mean matching imputations, while events with missing expenditure data were assigned to various recipient categories. Each event with missing expenditure data was assigned to a recipient category based on the extent of its missing charge and expenditure data. For example, an event with a known total charge but no expenditure information was assigned to one category, while an event with a known total charge and partial expenditure information was assigned to a different category. Similarly, events without a known total charge and no or partial expenditure information were assigned to various recipient categories.

The logical edits produced nine recipient categories for events with missing data. Eight of the categories were for events with a common pattern of missing data and a primary payer other than Medicaid. Medicaid events were imputed separately because persons on Medicaid rarely know the provider's charge for services or the amount paid by the state Medicaid program. As a result, the total charge for Medicaid-covered services was imputed and discounted to reflect the amount that a state program would pay for the care.

Separate predictive mean matching imputations were used to impute missing data in each of the eight recipient categories. The donor pool included "free events" because, in some instances, providers are not paid for their services. These events represent charity care, bad debt, provider failure to bill, and third party payer restrictions on reimbursement in certain circumstances. If free events were excluded from the donor pool, total expenditures would be over-counted because the distribution of free event among complete events (donors) is not represented among incomplete events (recipients).

### ***Imputation Flag Variable (IMPFLAG)***

IMPFLAG is a six-category variable that indicates if the event contains complete Household Component (HC) or Medical Provider Component (MPC) data, was fully or partially imputed, or was imputed in the capitated imputation process (for OP and MV events only). The following list identifies how the imputation flag is coded; the categories are mutually exclusive.

IMPFLAG = 0 not eligible for imputation (includes zeroed-out and flat fee leaf events)

IMPFLAG = 1 complete HC data

IMPFLAG = 2 complete MPC data (not applicable to DV events)

IMPFLAG = 3 fully imputed

IMPFLAG = 4 partially imputed

IMPFLAG = 5 complete MPC data through capitation imputation (not applicable to DV events)

### ***Flat Fee Expenditures***

The approach used to count expenditures for flat fees was to place the expenditure on the first visit of the flat fee group. The remaining visits have zero payments. Thus, if the first visit in the flat fee group occurred prior to 2020, all of the events that occurred in 2020 will have zero payments. Conversely, if the first event in the flat fee group occurred at the end of 2020, the total expenditure for the entire flat fee group will be on that event, regardless of the number of events it covered after 2020. See Section 2.5.3 for details on the flat fee variables.

### ***Zero Expenditures***

As noted above, there are some dental events reported by respondents where the payments were zero. This could occur when (1) the visit was covered under a flat fee arrangement (flat fee payments are included only on the first event covered by the arrangement), (2) there was no charge for a follow-up visit, (3) the provider was never paid directly for services provided by an individual, insurance plan, or other source, (4) the charges were included in another bill, or (5) the event was paid through government or privately funded research or clinical trial. If all of the medical events for a person fell into one of these categories, then the total annual expenditures for that person would be zero.

## ***Sources of Payment***

In addition to total expenditures, variables are provided which itemize expenditures according to major source of payment categories. These categories are:

1. Out-of-pocket by User (self or family) - includes any deductible, coinsurance, and copayment amounts not covered by other sources, as well as payments for services and providers not covered by the person's insurance or other sources,
2. Medicare,
3. Medicaid,
4. Private Insurance,
5. Veterans Administration/CHAMPVA, excluding TRICARE,
6. TRICARE,
7. Other Federal Sources - includes Indian Health Service, military treatment facilities, and other care by the federal government,
8. Other State and Local Source - includes community and neighborhood clinics, state and local health departments, and state programs other than Medicaid,
9. Workers' Compensation, and
10. Other Unclassified Sources - includes sources such as automobile, homeowner's, and liability insurance, and other miscellaneous or unknown sources.

## ***Dental Expenditure Variables (DVSF20X - DVTC20X)***

DVSF20X - DVOT20X are the 10 sources of payment. DVXP20X is the sum of the 10 sources of payment for the dental expenditures, and DVTC20X is the total charge. The 10 sources of payment are: self/family (DVSF20X), Medicare (DVMR20X), Medicaid (DVMD20X), private insurance (DVPV20X), Veterans Administration/CHAMPVA (DVVA20X), TRICARE (DVTR20X), other Federal sources (DVOF20X), State and Local (non-federal) government sources (DVSL20X), Workers' Compensation (DVWC20X) and other insurance (DVOT20X).

## ***Rounding***

Expenditure variables on the 2020 dental file have been rounded to the nearest penny. Person-level expenditure information to be released on the MEPS 2020 Full Year Consolidated File will be rounded to the nearest dollar. It should be noted that using the MEPS event files to create person-level totals will yield slightly different totals than those found on the full-year consolidated file. These differences are due to rounding only. Moreover, in some instances, the number of persons having expenditures on the event files for a particular source of payment may

differ from the number of persons with expenditures on the person-level expenditure file for that source of payment. This difference is also an artifact of rounding only.

## **3.0 Survey Sample Information**

### **3.1 Discussion of Pandemic Effects on Quality of 2020 MEPS Data**

#### **3.1.1 Summary**

Data collection for in-person sample surveys in 2020 presented real challenges after the onset of the COVID-19 pandemic at a national level in mid-March of that year. After major modifications to the standard MEPS study design, it was possible to collect data safely, but there were naturally concerns about the quality of the data after such modifications. Some issues related to data quality were identified and are discussed below. As with most in-person surveys conducted in 2020, researchers are counseled to take care in the interpretation of 2020 estimates including the comparison of such estimates with those of other years.

#### **3.1.2 Overview**

The onset of the COVID-19 pandemic in 2020 had a major impact on the MEPS Household Component (MEPS-HC) as it did for most major federal surveys and, of course, American life generally. The following discussion describes 1) the general impact of the pandemic on three major federal surveys (the effects on two of which also affect MEPS); 2) modifications to the MEPS sample design and field operations in 2020 due to the pandemic; and 3) potential data quality issues in the FY 2020 MEPS data related to the COVID-19 pandemic.

#### **3.1.3 The Impact of the Pandemic on some Major Federal Surveys**

Many important federal surveys were collecting data when much of the nation shut down in the face of the pandemic in March 2020. Among them were the Current Population Survey (CPS), the American Community Survey (ACS), and the National Health Interview Survey (NHIS). The ACS and the NHIS field new samples each year. The CPS includes rotating panels, meaning some of the sampled households fielded had participated in prior years while others were fresh. Two of these surveys have important roles in MEPS. Estimates of CPS subgroups serve as benchmarks for the MEPS weighting process (referred to below as “raking control totals”) while households fielded for Round 1 of MEPS in each year are selected as a subsample of the NHIS responding households from the prior year.

Because data collection in 2020 occurred under such unusual circumstances, all three of these surveys have reported bias concerns. (In fact, the ACS decided not to release a standard database for 2020 due to the uncertain quality of the data, while the CPS and the NHIS released data but included reports discussing concerns about bias.) All three surveys have reported evidence of nonresponse bias, specifically, that households in higher socio-economic levels were relatively

more likely to respond and the sample weighting was unable to fully compensate for this. As a result, analysts have been cautioned about the accuracy of survey estimates and the ability to compare resulting estimates with estimates obtained in the years prior to the pandemic.

The quality of CPS data is of particular importance to Full Year 2020 MEPS PUFs as CPS estimates serve as the control totals for the raking component of the MEPS weighting process. These control totals are based on the following demographic variables: age, sex, race/ethnicity, region, MSA status, educational attainment, and poverty status. The CPS estimates used in the development of the FY 2020 MEPS PUF weights that were based on the variables age, sex, race/ethnicity, region, and MSA status were evaluated by the Census Bureau and determined to be of high quality. However, similar evaluations of the corresponding CPS estimates associated with educational attainment and poverty status found that these estimates suffered from bias.

A set of references discussing the fielding of these three surveys during the pandemic and resulting bias concerns can be found in the References section of this document.

### **3.1.4 Modifications to the MEPS-HC 2020 Sample Design and Implementation Effort in Response to the Pandemic**

For the MEPS-HC, face-to-face interviewing ceased due to the COVID-19 pandemic on March 17, 2020. At that time, there were two MEPS panels in the field for which 2020 data were being collected: Round 1 of Panel 25 and Round 3 of Panel 24. The sampled households for Panel 25 were being contacted and asked to participate in MEPS for the first time while those from Panel 24 had already participated in MEPS for two rounds. A third MEPS panel was also in the field in early 2020, Round 5 of Panel 23, collecting data for the last portion of 2019.

In developing a plan for how best to resume MEPS data collection, the primary issues were how to do so safely for both sampled household members and interviewers and the potential impact on data quality. Telephone data collection, although not the preferred method of data collection in general for MEPS-HC, was the natural option because it did not require in-person contact with respondents and could be implemented relatively quickly. The impact of changing to telephone on both response rates and data quality was expected to be larger for Panel 25 Round 1 (e.g., no experience with reporting health care events in the recent past). At the time in-person interviewing stopped in mid-March 2020 completion rates for Panels 23 and 24 were substantially higher than those for Panel 25.

AHRQ decided to field Panel 23 for at least one more year, asking Panel 23 respondents if they would be open to further participation in MEPS in newly added Rounds 6 and 7. Extending Panel 23 was meant to both offset the decrease in the number of cases in the FY 2020 data related to lower expected sample yields for Panel 25 and to improve data quality by retaining a set of participants who were familiar with MEPS. These decisions required major changes in survey operations, including adding a fall Panel 23 Round 6 interview covering all 2020 events from January 1, 2020 to the date of the interview.

### **3.1.5 Data Quality Issues for MEPS for FY 2020**

Numerous analyses were conducted to examine potential impacts on data quality and to gain a more complete understanding of these issues. Zuvekas and Kashihara (2021) discuss some of these analyses and provide additional background information on how the MEPS study design was modified in 2020 in response to the pandemic. Three sources of potential bias that were identified are noted here: the long recall period for Round 6 of Panel 23; switching from in-person to telephone interviewing which likely had a larger impact on Panel 25; and the impact of CPS bias on the MEPS weights. Each is considered in turn.

Comparisons of health care utilization data for Panel 24 and Panel 23 indicated that the extended reference period for Panel 23 Round 6 may have resulted in recall issues for respondents. Round 6 was initially fielded in the late summer and early fall of 2020, and because the Round 5 reference period ended on December 31, 2019, the recall period for health care events and related information extended back to January 1, 2020, much longer than for typical MEPS rounds. For Panel 23 Round 6 respondents, events of a less salient nature, such as dental visits and office-based physician visits, occurring in early 2020 were under-reported. Underreporting was confirmed through both an examination of differential utilization across 2020 for Panel 23 respondents as well as statistical comparisons of Panel 23 and Panel 24 event estimates. Adjustments were made to the sample weights for Panel 23 to help address this concern. Details on these adjustments can be found in Section 3.3.1.

Comparisons of Panel 25 with Panel 24 health care utilization data found that the difference in estimates reached statistical significance for several event types with those from Panel 25 generally being the higher. The same comparisons between first and second year panels in MEPS in recent years showed relatively few such differences with no differences at all in 2019.

Finally, AHRQ decided to calibrate, via raking, the FY 2020 Consolidated PUF weights to control totals reflecting CPS 2021 poverty status data. As discussed earlier, bias was identified by the Census Bureau in the 2020 and 2021 CPS income data and correlates. Nevertheless, the Census Bureau decided to use its standard sample weighting approach for both the 2020 and 2021 CPS ASEC data sets while recognizing some deficiencies in the nonresponse adjustment approach for the two years as a result of data collection during the pandemic. Similarly, MEPS has used poverty status based on the CPS estimates for calibration for many years and continued to do so for the 2020 Full Year Consolidated PUF as it was decided that the advantages of doing so outweighed the disadvantages.

### **3.1.6 Discussion and Guidance**

The additional procedures for developing person-level and family-level final weights for the 2020 Consolidated MEPS data were designed to correct for potential biases in the data due to changes in data collection and response bias. However, evaluations of MEPS data quality in 2020 - corroborated in analyses of other Federal surveys fielded in 2020 - suggest that users of the MEPS FY 2020 Consolidated PUF should exercise caution when interpreting estimates and assessing analyses based on these data as well as in comparing 2020 estimates to those of prior years.

## 3.2 Sample Weight (PERWT20F)

There is a single full-year person-level weight (PERWT20F) assigned to each record for each key, in-scope person who responded to MEPS for the full period of time that he or she was in-scope during 2020. A key person was either a member of a responding NHIS household at the time of interview or joined a family associated with such a household after being out-of-scope at the time of the NHIS (the latter circumstance includes newborns as well as those returning from military service, an institution, or residence in a foreign country). A person is in-scope whenever he or she is a member of the civilian noninstitutionalized portion of the U.S. population.

## 3.3 Details on Person Weight Construction

The person-level weight PERWT20F was developed in several stages. Person-level weights for Panel 23, Panel 24, and Panel 25 were created separately. The weighting process for each panel included an adjustment for nonresponse over time and calibration to independent population figures. The calibration was initially accomplished separately for each panel by raking the corresponding sample weights for those in-scope at the end of the calendar year to Current Population Survey (CPS) population estimates based on six variables. The six variables used in the establishment of the initial person-level control figures were: educational attainment of the reference person (no degree, high school/GED no college, some college, bachelor's degree or higher); census region (Northeast, Midwest, South, West); MSA status (MSA, non-MSA); race/ethnicity (Hispanic; Black, non-Hispanic; Asian, non-Hispanic; and other); sex; and age. A 2020 composite weight was then formed by multiplying each weight from Panel 23 by the factor .29, each weight from Panel 24 by the factor .36, and each weight from Panel 25 by the factor .35. The choice of factors reflected the relative sample sizes of the three panels, helping to limit the variance of estimates obtained from pooling the three samples. The composite weight was raked to the same set of CPS-based control totals.

The standard approach for MEPS weighting is as follows. When the poverty status information derived from income variables becomes available, a final raking is undertaken. The full sample weight appearing on the Population Characteristics PUF for a given year is re-raked, establishing control figures reflecting poverty status rather than educational attainment. Thus, control totals are established using poverty status (five categories: below poverty, from 100 to 125 percent of poverty, from 125 to 200 percent of poverty, from 200 to 400 percent of poverty, at least 400 percent of poverty) as well as the other five variables previously used in the weight calibration.

This approach was modified for the full sample weights appearing on the FY 2020 Consolidated PUF. The raking of the Panel 23 weights was re-done as described in Section 3.3.1 below, and then the resulting Panel 23 weights were composited with those previously established for Panels 24 and 25 with the same factors as described previously, producing a new full sample weight. This new weight was then raked to control figures reflecting the standard five variables plus poverty status.

### 3.3.1 MEPS Panel 23 Weight Development Process

The person-level weight for MEPS Panel 23 was developed using the 2019 full-year weight for an individual as the initially assigned weight for 2019 survey participants present in 2020. For key, in-scope members who joined an RU some time in 2020 after being out-of-scope in 2019, the initially assigned person-level weight was the corresponding 2019 family weight. The weighting process included an adjustment for person-level nonresponse over Rounds 6 and 7 as well as raking to population control figures for December 2020 for key, responding persons in-scope on December 31, 2020. These control totals were derived by scaling back the population distribution obtained from the March 2021 CPS to reflect the December 31, 2020 estimated population total (estimated based on Census projections for January 1, 2021). Variables used for person-level raking included: education of the reference person (three categories: no degree; high school/GED only or some college; Bachelor’s or higher degree); Census region (Northeast, Midwest, South, West); MSA status (MSA, non-MSA); race/ethnicity (Hispanic; Black, non-Hispanic; Asian, non-Hispanic; and other); sex; and age. (It may be noted that for confidentiality reasons, the MSA status variables are no longer released for public use. This started with the Full-Year 2013 Person-Level Use PUF.) The final weight for key, responding persons who were not in-scope on December 31, 2020 but were in-scope earlier in the year was the nonresponse-adjusted person weight without raking.

In developing the person-level weight for Panel 23, an additional raking dimension was included beyond those based on the usual six variables. This dimension was added to adjust the distribution of event-based (i.e., office-based [MV] and/or outpatient [OP]) estimates to align with corresponding Panel 24 weighted estimates. The table below shows ratios of weighted totals (population estimates) associated with this additional raking dimension, reflecting the extent to which the Panel 23 estimates were modified in order to correspond to Panel 24 estimates. Generally, the weights of the records with any event in Q1 are inflated to account for the under reporting of events in Q1.

#### Ratio of Adjusted to Unadjusted Weights

| # of Events  | Ratio  |
|--|--------|
| 1: No MV/OP Events   | 0.8375 |
| 2: At least 1 event in Q1 and no events in other quarters                  | 2.7509 |
| 3: At least 1 event in Q2 and no events in other quarters                  | 0.9456 |
| 4: At least 1 event in Q3 and no events in other quarters                  | 0.7811 |
| 5: At least 1 event in Q4 and no events in other quarters                  | 0.7149 |
| 6: At least 1 event in Q1 and at least 1 event in at least 1 other quarter | 1.3188 |
| 7: At least 1 event in Q2 and at least 1 event in at least 1 Q3 or Q4      | 0.7199 |
| 8: Other   | 0.6908 |

The Panel 23 2019 full-year weight used as the base weight for Panel 23 was derived from the 2018 MEPS Round 1 weight and reflected adjustment for nonresponse over the remaining data



collection rounds in 2018 and 2019 as well as raking to the December 2018 and December 2019 population control figures.

For the raking variable “education of the reference person” there were four raking categories in prior years: no degree; high school/GED no college; some college; and Bachelor's or a higher degree. However, as mentioned in the discussion of data quality issues in 2020 in Section 3.1, there was evidence that the onset of the COVID-19 pandemic in the years of 2020 and 2021 affected estimates associated with income and education (further details can be found in the references associated with the CPS data quality issues in 2020 and 2021 in the References section). For the full-year 2019 weights, March 2019 CPS was utilized instead of March 2020 CPS in the construction of control totals to avoid data quality issues connected to the COVID-19 pandemic. For the full-year 2020 weights, since there are no reliable education estimates from 2020 or 2021 CPS, a regression approach was implemented to derive education control figures. The regression approach involved two steps. The first step fit a linear regression model for each of the four education categories using the 2013-2018 CPS education of reference person distributions as the predictors in order to estimate the distribution for 2020, and the second step derived the education of reference person control figures by applying the estimated 2020 education distribution to the December 31, 2020 population total. The models for “no degree” and “Bachelor's or a higher degree” performed extremely well with  $R^2$  values of 0.97 and 0.98, respectively. The models for “high school/GED no college” and “some college” showed a lower goodness of fit, especially for some college, with a  $R^2$  value of 0.74. A linear regression for the two categories combined improved the  $R^2$  value to 0.89, so the two levels were combined for the 2020 weight development.

### **3.3.2 MEPS Panel 24 Weight Development Process**

The person-level weight for MEPS Panel 24 was developed using the 2019 full-year weight for an individual as a “base” weight for survey participants present in 2019. For key, in-scope members who joined an RU some time in 2020 after being out-of-scope in 2019, the initially assigned person-level weight was the corresponding 2019 family weight. The weighting process included an adjustment for person-level nonresponse over Rounds 4 and 5 as well as raking to population control totals for December 2020 used for the MEPS Panel 23 weights for key, responding persons in-scope on December 31, 2020. The six standard variables employed for Panel 23 raking (education level, census region, MSA status, race/ethnicity, sex, and age) were also used for Panel 24 raking. Similar to Panel 23, the Panel 24 final weight for key, responding persons not in-scope on December 31, 2020 but in-scope earlier in the year was the nonresponse-adjusted person weight without raking.

Note that the 2019 full-year weight that was used as the base weight for Panel 24 was derived as follows; adjustment of the 2019 MEPS Round 1 weight for nonresponse over the remaining data collection rounds in 2019; and raking the resulting nonresponse adjusted weight to December 2019 population control figures.

### **3.3.3 MEPS Panel 25 Weight Development Process**

The person-level weight for MEPS Panel 25 was developed using the 2020 MEPS Round 1 person-level weight as a “base” weight. The MEPS Round 1 weights incorporated the following components: the original household probability of selection for the NHIS, use of a subsample of the NHIS panels and quarters reserved for MEPS, an adjustment for NHIS nonresponse, the probability of selection for MEPS from NHIS responding households, adjustment for nonresponse at the dwelling unit level for Round 1, and poststratification to control figures at the person level obtained from the March CPS of the corresponding year. For key, in-scope members who joined an RU after Round 1, the Round 1 family weight served as a “base” weight.

The weighting process also included an adjustment for nonresponse over the remaining data collection rounds in 2020 as well as raking to the same population control figures for December 2020 used for the MEPS Panel 23 and Panel 24 weights for key, responding persons in-scope on December 31, 2020. The six standard variables employed for Panel 23 and Panel 24 raking (educational attainment of the reference person, census region, MSA status, race/ethnicity, sex, and age) were also used for Panel 25. The event-based raking dimension used for Panel 23 was not employed for Panel 25. Similar to Panel 23 and Panel 24, the Panel 25 final weight for key, responding persons who were not in-scope on December 31, 2020 but were in-scope earlier in the year was the person weight after the nonresponse adjustment.

### **3.3.4 The Final Weight for 2020**

The final raking of those in-scope at the end of the year has been described above. In addition, the composite weights of three groups of persons who were out-of-scope on December 31, 2020 were adjusted for expected undercoverage. Specifically, the weights of those who were in-scope some time during the year, out-of-scope on December 31, and entered a nursing home during the year and still residing in a nursing home at the end of the year were poststratified to an estimate of the number of persons who were residents of Medicare- and Medicaid-certified nursing homes for part of the year (approximately 3-9 months) during 2014. This estimate was developed from data on the Minimum Data Set (MDS) of the Center for Medicare and Medicaid Services (CMS). The weights of persons who died while in-scope were poststratified to corresponding estimates derived using data obtained from the Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS), Underlying Cause of Death, 1999-2020 on [CDC WONDER Online Database](#), released in 2022, the latest available data at the time. Separate decedent control totals were developed for the “65 and older” and “under 65” civilian noninstitutionalized populations.

Overall, the weighted population estimate for the civilian noninstitutionalized population for December 31, 2020 is 324,539,180 (PERWT20F >0 and INSC1231=1). The sum of person-level weights across all persons assigned a positive person-level weight is 328,545,297.

## **3.4 Coverage**

The target population for MEPS in this file is the 2020 U.S. civilian noninstitutionalized population. However, the MEPS sampled households are a subsample of the NHIS households

interviewed in 2017 (Panel 23), 2018 (Panel 24), and 2019 (Panel 25). New households created after the NHIS interviews for the respective panels and consisting exclusively of persons who entered the target population after 2017 (Panel 23), after 2018 (Panel 24), or after 2019 (Panel 25) are not covered by MEPS. Neither are previously out-of-scope persons who join an existing household but are unrelated to the current household residents. Persons not covered by a given MEPS panel thus include some members of the following groups: immigrants; persons leaving the military; U.S. citizens returning from residence in another country; and persons leaving institutions. The set of uncovered persons constitutes a relatively small segment of the MEPS target population.

### **3.5 Using MEPS Data for Trend Analysis**

First, of course, we note that there are uncertainties associated with 2020 data quality as discussed in Section 3.1. Evaluations described in that section suggest that care should be taken in the interpretation of estimates based on data collected in 2020 as well as in comparisons over time. Trend analyses are challenging since the advent of the COVID-19 pandemic resulted in uncertain data quality for MEPS as well as standard benchmark sources such as the CPS, ACS, and NHIS while the pandemic also had an impact on the health and access to health care of the U.S. population. For such reasons, the extent to which 2020 health care parameters may differ from those of prior years is difficult to assess.

In terms of other factors to be aware of, MEPS began in 1996, and the utility of the survey for analyzing health care trends expands with each additional year of data; however, it is important to consider a variety of factors when examining trends over time using MEPS. Tests of statistical significance should be conducted to assess the likelihood that observed trends are not attributable to sampling variation. The length of time being analyzed should also be considered. In particular, large shifts in survey estimates over short periods of time (e.g. from one year to the next) that are statistically significant should be interpreted with caution unless they are attributable to known factors such as changes in public policy, economic conditions, or MEPS survey methodology.

With respect to methodological considerations, in 2013 MEPS introduced an effort focused on field procedure changes such as interviewer training to obtain more complete information about health care utilization from MEPS respondents with full implementation in 2014. This effort likely resulted in improved data quality and a reduction in underreporting starting in the second half of 2013 and throughout 2014 full year files and have had some impact on analyses involving trends in utilization across years. The aforementioned changes in the NHIS sample design in 2016 could also potentially affect trend analyses. The new NHIS sample design is based on more up-to-date information related to the distribution of housing units across the U.S. As a result, it can be expected to better cover the full U.S. civilian, noninstitutionalized population, the target population for MEPS as well as many of its subpopulations. Better coverage of the target population helps to reduce the potential for bias in both NHIS and MEPS estimates.

Another change with the potential to affect trend analyses involved modifications to the MEPS instrument design and data collection process, particularly in the events sections of the instrument. These were introduced in the Spring of 2018 and thus affected data beginning with Round 1 of Panel 23, Round 3 of Panel 22, and Round 5 of Panel 21. Since the Full Year 2017

PUFs were established from data collected in Rounds 1-3 of Panel 22 and Rounds 3-5 of Panel 21, they reflected two different instrument designs. In order to mitigate the effect of such differences within the same full year file, the Panel 22 Round 3 data and the Panel 21 Round 5 data were transformed to make them as consistent as possible with data collected under the previous design. The changes in the instrument were designed to make the data collection effort more efficient and easy to administer. In addition, expectations were that data on some items, such as those related to health care events, would be more complete with the potential of identifying more events. Increases in service use reported since the implementation of these changes are consistent with these expectations. **Data users should be aware of possible impacts on the data and especially trend analyses for these data years due to the design transition.**

Process changes, such as data editing and imputation, may also affect trend analyses. For example, users should refer to the 2020 Consolidated file (HC-224) and, for more detail, the documentation for the prescription drug file (HC-220A) when analyzing prescription drug spending over time.

As always, it is recommended that data users review relevant sections of the documentation for descriptions of these types of changes that might affect the interpretation of changes over time before undertaking trend analyses.

Analysts may wish to consider using techniques to smooth or stabilize analyses of trends using MEPS data such as comparing pooled time periods (e.g. 1996-1997 versus 2011-2012), working with moving averages, or using modeling techniques with several consecutive years of MEPS data to test the fit of specified patterns over time.

Finally, statistical significance tests should be conducted to assess the likelihood that observed trends are not attributable to sampling variation. In addition, researchers should be aware of the impact of multiple comparisons on Type I error. Without making appropriate allowance for multiple comparisons, undertaking numerous statistical significance tests of trends increases the likelihood of concluding that a change has taken place when one has not.

## **4.0 Strategies for Estimation**

### **4.1 Developing Event-Level Estimates**

The data in this file can be used to develop national 2020 event-level estimates for the U.S. civilian noninstitutionalized population on dental visits as well as expenditures, and sources of payment for these visits. The weight assigned to each dental visit reported is the person-level weight of the person who visited the dentist. If a person reported several visits, each visit is assigned that individual's person-level weight. Estimates of total visits are the sum of the weight variable (PERWT20F) across relevant event records while estimates of other variables must be weighted by PERWT20F to be nationally representative. For example, the appropriate estimate for the mean out-of-pocket payment per dental visit can be represented as follows (the subscript

‘j’ identifies each event and represents a numbering of events from 1 through the total number of events in the file):

$$(\sum W_j X_j) / (\sum W_j), \text{ where,}$$

$$W_j = \text{PERWT20F}_j \quad (\text{full year person weight for the person associated with event } j), \text{ and}$$

$$X_j = \text{DVSF20X}_j \quad (\text{amount paid by self/family for event } j)$$

Estimates and corresponding [standard errors \(SE\)](#) can be derived using an appropriate computer software package for complex survey analysis such as SAS, Stata, SUDAAN, R, or SPSS. The tables below contain the event-level estimates for several key variables on this file.

### Selected Event-Level Estimates

#### Visits

| Estimate of Interest                               | Variable Name | Estimate (SE)  | Estimate Excluding Zero Payment Events (SE) |
|--|---------------|----------------|---|
| Total number of dental visits (in millions)        | PERWT20F      | 273.1 (9.12)   | 233.4 (7.57)                                |
| Proportion of dental visits with expenditures > 0* | DVXP20X       | 0.855 (0.0062) | -----                                       |

\*Zero payment events can occur in MEPS for the following reasons: (1) the visit was covered under a flat fee arrangement (flat fee payments are included only on the first event covered by the arrangement), (2) there was no charge for a follow-up visit, (3) the provider was never paid directly for services provided by an individual, insurance plan, or other source, (4) the charges were included in another bill, or (5) the event was paid through government or privately funded research or clinical trial.

#### Expenditures

| Estimate of Interest  | Variable Name       | Estimate (SE) | Estimate Excluding Zero Payment Events (SE) |
|---|---------------------|---------------|---|
| Mean total payments per visit   | DVXP20X             | \$381 (\$8.3) | \$446 (\$10.0)                              |
| Mean out-of-pocket payment per visit                                      | DVSF20X             | \$177 (\$6.2) | \$207 (\$7.6)                               |
| Mean proportion of total expenditures paid by private insurance per visit | DVPV20X/<br>DVXP20X | -----         | 0.516 (0.0077)                              |

## Expenditures: Dental Hygienist Visits (DENTHYG = 1)

| Estimate of Interest   | Variable Name       | Estimate (SE) | Estimate Excluding Zero Payment Events (SE) |
|--|---------------------|---------------|---|
| Mean total payments per visit where person saw hygienist   | DVXP20X             | \$243 (\$7.4) | \$249 (\$7.7)                               |
| Mean out-of-pocket payment per visit where person saw hygienist                                      | DVSF20X             | \$78 (\$4.4)  | \$80 (\$4.5)                                |
| Mean proportion of total expenditures per visit paid by private insurance where person saw hygienist | DVPV20X/<br>DVXP20X | -----         | 0.611 (0.0110)                              |

### 4.2 Person-Based Estimates for Dental Care

To enhance analyses of dental care, analysts may link information about dental visits by sample persons in this file to the annual full-year consolidated file (which has data for all MEPS sample persons), or conversely, link person-level information from the full year consolidated file to this event-level file (see Section 5 below for more details). Both this file and the full-year consolidated file may be used to derive estimates for persons with dental care and annual estimates of total expenditures. However, for estimates that pertain to those who did not visit the dentist as well as those who did (for example, the percentage of adults who visited the dentist at least once during the past year or the mean number of visits to the dentist in the past year among those 65 or older) this file cannot be used. Only those persons with at least one dental visit are represented on this data file. The full year consolidated file must be used for person-level analyses that include both persons with and without dental care.

### 4.3 Variables with Missing Values

It is essential that the analyst examine all variables for the presence of negative values used to represent missing values. For continuous or discrete variables, where means or totals may be estimated, it may be necessary to set negative values to values appropriate to the analytic needs. That is, the analyst should either impute a value or set the value to one that will be interpreted as missing by the software package used. For categorical and dichotomous variables, the analyst may want to consider whether to recode or impute a value for cases with negative values or whether to include or exclude such cases in the numerator and/or denominator when calculating proportions.

Methodologies used for the editing/imputation of expenditure variables (e.g., sources of payment, flat fee, and zero expenditures) are described in “Data Editing and Imputation Methodologies of Expenditure Variables”.

## 4.4 Variance Estimation (VARPSU, VARSTR)

The MEPS has a complex sample design. To obtain estimates of variability (such as the standard error of sample estimates or corresponding confidence intervals) for MEPS estimates, analysts need to take into account the complex sample design of MEPS for both person-level and family-level analyses. 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. Various software packages provide analysts with the capability of implementing these methodologies. MEPS analysts most commonly use the Taylor Series approach. Although this data file does not contain replicate weights, the capability of employing replicate weights constructed using the Balanced Repeated Replication (BRR) methodology is also provided if needed to develop variances for more complex estimators (see Section 4.4.2).

### 4.4.1 Taylor-series Linearization Method

The variables needed to calculate appropriate standard errors based on the Taylor-series linearization method are included on this file as well as all other MEPS public use files. Software packages that permit the use of the Taylor-series linearization method include SUDAAN, R, Stata, SAS (version 8.2 and higher), and SPSS (version 12.0 and higher). For complete information on the capabilities of a package, analysts should refer to the corresponding software user documentation.

Using the Taylor-series linearization method, variance estimation strata and the variance estimation PSUs within these strata must be specified. The variables VARSTR and VARPSU on this MEPS data file serve to identify the sampling strata and primary sampling units required by the variance estimation programs. Specifying a “with replacement” design in one of the previously mentioned computer software packages will provide estimated standard errors appropriate for assessing the variability of MEPS survey estimates. It should be noted that the number of degrees of freedom associated with estimates of variability indicated by such a package may not appropriately reflect the number available. For variables of interest distributed throughout the country (and thus the MEPS sample PSUs), one can generally expect to have at least 100 degrees of freedom associated with the estimated standard errors for national estimates based on this MEPS database.

Prior to 2002, MEPS variance strata and PSUs were developed independently from year to year, and the last two characters of the strata and PSU variable names denoted the year. However, beginning with the 2002 Point-in-Time PUF, the variance strata and PSUs were developed to be compatible with all future PUFs until the NHIS design changed. Thus, when pooling data across years 2002 through the Panel 11 component of the 2007 files, the variance strata and PSU variables provided can be used without modification for variance estimation purposes for estimates covering multiple years of data. There were 203 variance estimation strata, each stratum with either two or three variance estimation PSUs.

From Panel 12 of the 2007 files, a new set of variance strata and PSUs were developed because of the introduction of a new NHIS design. There are 165 variance strata with either two or three

variance estimation PSUs per stratum, starting from Panel 12. Therefore, there are a total of 368 (203+165) variance strata in the 2007 full-year file as it consists of two panels that were selected under two independent NHIS sample designs. Since both MEPS panels in the full-year files from 2008 through 2016 are based on the next NHIS design, there are only 165 variance strata. These variance strata (VARSTR values) have been numbered from 1001 to 1165 so that they can be readily distinguished from those developed under the former NHIS sample design in the event that data are pooled for several years.

As discussed, a complete change was made to the NHIS sample design in 2016, effectively changing the MEPS design beginning with calendar year 2017. There were 117 variance strata originally formed under this new design intended for use until the next fully new NHIS design was implemented. In order to make the pooling of data across multiple years of MEPS more straightforward, the numbering system for the variance strata has changed. Those strata associated with the new design (implemented in 2016) were numbered from 2001 to 2117.

However, the new NHIS sample design implemented in 2016, was further modified in 2018. With the modification in the 2018 NHIS sample design, the MEPS variance structure for the 2019 Full Year file has also had to be modified, reducing the number of variance strata to 105. Consistency was maintained with the prior structure in that the 2019 Full Year file variance strata were also numbered within the range of values from 2001-2117, although there are now gaps in the values assigned within this range.

Some analysts may be interested in pooling data across multiple years of MEPS data. As noted on the cover page of this document, due to data quality issues arising from collecting data during the COVID-19 pandemic in 2020, caution should be taken when interpreting the results of such pooling.

If pooling is to be undertaken, it should be noted that, to obtain appropriate standard errors when doing so, it is necessary to specify a common variance structure. Prior to 2002, each annual MEPS public use file was released with a variance structure unique to the particular MEPS sample in that year. Starting in 2002, the annual MEPS public use files were released with a common variance structure that allowed users to pool data from 2002 through 2018. However, with the need to modify the variance structure beginning with 2019, this can no longer be routinely done.

To ensure that variance strata are identified appropriately for variance estimation purposes when pooling MEPS data across several years, one can proceed as follows:

1. When pooling any year from 2002 through 2018, use the variance strata numbering as is.
2. When pooling (a) any year from 1996 to 2001 with any year from 2002 or later, or (b) 2019 and beyond with any earlier year, use the pooled linkage public use file HC-036 that contains the proper variance structure. The HC-036 file is updated every year so that appropriate variance structures are available with pooled data. Further details on the HC-036 file can be found in the public use documentation of the HC-036 file.



#### **4.4.2 Balanced Repeated Replication (BRR) Method**

BRR replicate weights are not provided on this MEPS PUF for the purposes of variance estimation. However, a file containing a BRR replication structure is made available so users can form replicate weights, if desired, from the final MEPS weight to compute variances of MEPS estimates using either BRR or Fay's modified BRR (Fay 1989) methods. The replicate weights are useful to compute variances of complex non-linear estimators for which a Taylor linear form is not easy to derive and not available in commonly used software. For instance, it is not possible to calculate the variances of a median or the ratio of two medians using the Taylor linearization method. For these types of estimators, users may calculate a variance using BRR or Fay's modified BRR methods. However, it should be noted that the replicate weights have been derived from the final weight through a shortcut approach. Specifically, the replicate weights are not computed starting with the base weight and all adjustments made in different stages of weighting are not applied independently in each replicate. Thus, the variances computed using this one-step BRR do not capture the effects of all weighting adjustments that would be captured in a set of fully developed BRR replicate weights. The Taylor Series approach does not fully capture the effects of the different weighting adjustments either.

The dataset, HC-036BRR, MEPS 1996-2018 Replicates for Variance Estimation File, contains the information necessary to construct the BRR replicates. It contains a set of 128 flags (BRR1-BRR128) in the form of half sample indicators, each of which is coded 0 or 1 to indicate whether the person should or should not be included in that particular replicate. These flags can be used in conjunction with the full-year weight to construct the BRR replicate weights. For analysis of MEPS data pooled across years, the BRR replicates can be formed in the same way using the HC-036, MEPS 1996-2018 Pooled Linkage Variance Estimation File. For more information about creating BRR replicates, users can refer to the documentation for the [HC-036BRR pooled linkage file](#) on the AHRQ website.

## **5.0 Merging/Linking MEPS Data Files**

Data from this file can be used alone or in conjunction with other files for different analytic purposes. This section summarizes various scenarios for merging/linking MEPS event files. The set of households selected for MEPS is a subsample of those participating in the National Health Interview Survey (NHIS), thus, each MEPS panel can also be linked back to the previous year's NHIS public use data files. For information on obtaining MEPS/NHIS link files please see the [MEPS website](#).

### **5.1 Linking to the Person-Level File**

Merging characteristics of interest from other MEPS files (e.g., 2020 Full Year Consolidated File or 2020 Prescribed Medicines File) expands the scope of potential estimates. For example, to estimate the total number of dental events of persons with specific demographic characteristics

(such as age, race, and sex), population characteristics from a person-level file need to be merged onto the Dental file. This procedure is shown below.

1. Create data set PERSX by sorting the 2020 Full Year Consolidated File, by the person identifier, DUPERSID. Keep only variables to be merged onto the Dental file and DUPERSID.
2. Create data set DENT by sorting the dental event file by person identifier, DUPERSID.
3. Create final data set NEWDENT by merging these two files by DUPERSID, keeping only records on the dental event file.

The following is an example of SAS code that completes these steps:

```
PROC SORT DATA=HCXXX (KEEP=DUPERSID AGE31X AGE42X AGE53X
SEX RACEV1X EDUCYR HIDEG) OUT=PERSX;
    BY DUPERSID;
RUN;

PROC SORT DATA=DENT;
    BY DUPERSID;
RUN;

DATA NEWDENT;
MERGE DENT (IN=A) PERSX (IN=B);
    BY DUPERSID;
IF A;
RUN;
```

## **5.2 Linking to the Prescribed Medicines File**

The RXLK file provides a link from the MEPS event files to the 2020 Prescribed Medicines Event File. When using RXLK, data users/analysts should keep in mind that one dental visit can link to more than one prescribed medicine record. Conversely, a prescribed medicine event may link to more than one dental visit or different types of events. When this occurs, it is up to the data user/analyst to determine how the prescribed medicine expenditures should be allocated among those medical events.

## **5.3 Linking to the Medical Conditions File**

Conditions data are not collected for dental events; therefore, this file cannot be linked to the Conditions File.

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## D. Variable-Source Crosswalk

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### FOR MEPS HC-220B: 2020 DENTAL VISITS

#### Survey Administration Variables

| Variable | Description                       | Source               |
|----------|-----------------------------------|----------------------|
| DUID     | Panel # + Encrypted DU identifier | Assigned in sampling |
| PID      | Person number                     | Assigned in sampling |
| DUPERSID | Person ID (DUID + PID)            | Assigned in sampling |
| EVNTIDX  | Event ID                          | Assigned in sampling |
| EVENTRN  | Event round number                | CAPI derived         |
| FFEEIDX  | Flat fee ID                       | CAPI derived         |
| PANEL    | Panel Number                      | Constructed          |

#### Dental Events Variables

| Variable     | Description  | Source        |
|--------------|--|---------------|
| DVDATEYR     | Event date - year                                      | CAPI derived  |
| DVDATEMM     | Event date - month                                     | CAPI derived  |
| GENDENT_M18  | General dentist seen                                   | DN10          |
| DENTHYG_M18  | Dental hygienist seen                                  | DN10          |
| DNSPCLST_M18 | Dental specialist seen                                 | DN10          |
| PEDDENT_M18  | Pediatric dentist seen                                 | DN10          |
| DENTYPE_M18  | Other dental specialist seen                           | DN10          |
| EXAMINE_M18  | General exam, checkup or consultation                  | DN20          |
| CLENTETX     | Edited CLENTETH_M18                                    | DN20 (Edited) |
| CLENTETH_M18 | Cleaning, prophylaxis, polishing or periodontal recall | DN20          |
| JUSTXRYX     | Edited JUSTXRAY_M18                                    | DN20 (Edited) |
| JUSTXRAY_M18 | X-rays, radiographs or bitewings                       | DN20          |
| FLUORIDE_M18 | Fluoride treatment                                     | DN20          |
| SEALANTX     | Edited SEALANT_M18                                     | DN20 (Edited) |

| <b>Variable</b> | <b>Description</b>   | <b>Source</b>   |
|-----------------|--|-----------------|
| SEALANT_M18     | Sealant application  | DN20            |
| FILLINGX        | Edited FILLING_M18   | DN20 (Edited)   |
| FILLING_M18     | Fillings, inlays, crowns or caps                                 | DN20            |
| ROOTCANX        | Edited ROOTCANL_M18  | DN20 (Edited)   |
| ROOTCANL_M18    | Root canal   | DN20            |
| GUMSURGX        | Edited GUMSURG_M18   | DN20 (Edited)   |
| GUMSURG_M18     | Periodontal scaling, root planing or gum surgery                 | DN20            |
| IMPLANTX        | Edited IMPLANT_M18   | DN20 (Edited)   |
| IMPLANT_M18     | Implants   | DN20            |
| ORALSURX        | Edited ORALSURG_M18  | DN20 (Edited)   |
| ORALSURG_M18    | Extraction, tooth pulled or oth oral surgery                     | DN20            |
| BRIDGESX        | Edited BRIDGES_M18   | DN20 (Edited)   |
| BRIDGES_M18     | Fixed or relining/repair of bridges/dentures, removable dentures | DN20            |
| ORTHDONX        | Edited ORTHDONT_M18  | DN20 (Edited)   |
| ORTHDONT_M18    | Orthodontia, braces or retainers                                 | DN20            |
| DENTPROX        | Edited DENTPROC  | DN20OS (Edited) |
| DENTPROC        | Other dental procedures  | DN20OS          |
| DENTOTHX        | Other specify dental procedures edited                           | DN20OS (Edited) |

### **Flat Fee Variables**

| <b>Variable</b> | <b>Description</b>                  | <b>Source</b> |
|-----------------|-------------------------------------|---------------|
| FFDVTYPE        | Flat fee bundle                     | Constructed   |
| FFBEF20         | Total # of visits in FF before 2020 | FF50          |
| FFTOT21         | Total # of visits in FF after 2020  | FF60          |

### **Imputed Expenditure Variables**

| <b>Variable</b> | <b>Description</b>              | <b>Source</b>       |
|-----------------|---------------------------------|---------------------|
| DVSF20X         | Amount paid, family (Imputed)   | CP Section (Edited) |
| DVMR20X         | Amount paid, Medicare (Imputed) | CP Section (Edited) |
| DVMD20X         | Amount paid, Medicaid (Imputed) | CP Section (Edited) |

| <b>Variable</b> | <b>Description</b>                              | <b>Source</b>       |
|-----------------|---|---------------------|
| DVPV20X         | Amount paid, private insurance (Imputed)        | CP Section (Edited) |
| DVVA20X         | Amount paid, Veterans/CHAMPVA (Imputed)         | CP Section (Edited) |
| DVTR20X         | Amount paid, TRICARE (Imputed)                  | CP Section (Edited) |
| DVOF20X         | Amount paid, other federal (Imputed)            | CP Section (Edited) |
| DVSL20X         | Amount paid, state & local government (Imputed) | CP Section (Edited) |
| DVWC20X         | Amount paid, workers' comp (Imputed)            | CP Section (Edited) |
| DVOT20X         | Amount paid, other insurance (Imputed)          | CP Section (Edited) |
| DVXP20X         | Sum of DVSF20X - DVOT20X (Imputed)              | Constructed         |
| DVTC20X         | Household reported total charge (Imputed)       | CP Section (Edited) |
| IMPFLAG         | Imputation status                               | Constructed         |

### **Weights Variables**

| <b>Variable</b> | <b>Description</b>                   | <b>Source</b> |
|-----------------|--------------------------------------|---------------|
| PERWT20F        | Expenditure File Person Weight, 2020 | Constructed   |
| VARSTR          | Variance estimation stratum, 2020    | Constructed   |
| VARPSU          | Variance estimation PSU, 2020        | Constructed   |