

Methodological Comparison of Estimates of Ambulatory Health Care Use from the Medical Expenditure Panel Survey and Other Data Sources

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Abstract

Access and use of health care services are critical areas of interest for researchers and policymakers. Surveys used to analyze these issues have varying objectives and methodologies and can produce widely divergent estimates. Therefore analysts need to understand the data sources(s) being used and not presume that similar estimates or conclusions would result from alternative sources. The purpose of this paper is to illustrate the types of complexities/differences that arise when comparing estimates of ambulatory health care use from different sources. In particular, we compare 2007 data on health care use collected from several Federal sources (the Medical Expenditure Panel Survey, the National Health Interview Survey, the National Ambulatory Medical Care Survey, and the National Hospital Ambulatory Medical Care Survey).

KEY WORDS: MEPS, NHIS, NAMCS, NHAMCS, ambulatory care, health care use

1. Introduction¹

The amount of and trends in ambulatory health care utilization are important areas of interest for healthcare services researchers and policy makers. Surveys that contain healthcare utilization data used to analyze such issues may have different objectives and data collection methodologies. Thus, it is important to understand the available data sources and their methodologies in order to correctly interpret data from a given survey or make informed decisions about which survey data set(s) are most appropriate for a particular analysis (Machlin et al, 2001, and Machlin and Zodet, 2007).

The US Department of Health and Human Services (DHHS) sponsors several national surveys that have different objectives and methodologies, but all can be used to produce estimates of ambulatory health care use. Two of these surveys, the Medical Expenditure panel Survey (MEPS) and the National Health Interview Survey (NHIS), collect data through household interviews. In contrast, the National Ambulatory Medical Care Survey (NAMCS) collects data on patient visits in physicians' offices and the National Hospital Ambulatory Medical Care Survey (NHAMCS) collects data from hospitals pertaining to outpatient and emergency department visits (Machlin et al, 2001).

The purpose of this paper is to illustrate important methodological and other technical considerations that can affect analyses when using different surveys for measuring ambulatory health care use in office-based and hospital settings. Here we compare 2007 data on ambulatory health care use collected in the MEPS to data collected in the NHIS, NAMCS, and NHAMCS.

The MEPS is a subsample of households that participated in the previous year's NHIS. MEPS collects detailed data on health care use, expenditures, and sources of payment

¹ The views expressed in this paper are those of the authors and no official endorsement by the Department of Health and Human Services or the Agency for Healthcare Research and Quality are intended or should be inferred.

(<http://www.meps.ahrq.gov/>). The panel design of the survey includes five rounds of interviews that cumulatively cover two consecutive calendar years. At each interview, one adult respondent typically provides information about all persons in the household. Both the MEPS and the NHIS collect data by means of a computer assisted personal interview (CAPI) and cover the U.S. civilian noninstitutionalized population.

The NHIS is a cross-sectional household survey that collects annual data that are used to monitor the nation's health on a broad range of health topics (<http://www.cdc.gov/nchs/nhis.htm>). The core questionnaire contains four major components: household, family, sample adult, and sample child. The household and family questionnaires are completed for all households in the survey. From each family in the NHIS, one sample adult and one sample child are randomly selected and more detailed information on each is collected. The reference period for the health care use data is the 12 months prior to the time of the interview.

The NAMCS is a national probability sample survey. The unit of observation examined in this analysis for the NAMCES is the physician-patient encounter or visit. Only visits to the offices of nonfederally employed physicians classified by the American Medical Association (AMA) or the American Osteopathic Association (AOA) as providing office-based patient care are included in the sample. Data for sampled visits are recorded on patient record forms for an assigned reporting week (http://www.cdc.gov/nchs/ahcd/about_ahcd.htm).

The NHAMCS is a national probability sample of visits to outpatient and emergency departments of noninstitutional general and short-stay hospitals, exclusive of Federal, military, and Veterans Administration (VA) hospitals, hospital units of institutions, and hospitals with less than six beds. Within each hospital, all emergency departments and ambulatory surgery center (ASC) locations are selected. In addition, either all outpatient clinics or a sample of such units are selected. Clinics are eligible for the survey if ambulatory medical care is provided under the supervision of a physician and under the auspices of the hospital. Patient visits are systematically selected over a randomly assigned 4-week reporting period. A visit is defined as a direct, personal exchange between a physician, or a staff member operating under a physician's direction, for the purpose of seeking health care (http://www.cdc.gov/nchs/ahcd/about_ahcd.htm).

2. Methods/Analytic Approach

This section highlights important variations among the 2007 surveys and their implications for estimating ambulatory health care utilization. The variations described in this section relate to data collection methodologies, target populations, types of settings and providers covered (Machlin et al, 2001).

2.1 Ambulatory Care Data Collection Methodologies

The approach to collecting health care utilization differs markedly between the four surveys. The MEPS captures information on the broadest range of ambulatory care events in both office-based and hospital settings. During each MEPS interview round, of which there are five over a two year period, respondents are asked to identify visits during the reference period (usually 3-6 months in length) to health care providers made by themselves and their family members. Respondents report these visits based on the setting of care (office-based, outpatient or emergency department) and provider type (Machlin et al, 2001). Thus, total numbers of visits are available from MEPS because an

annual count of visits for each MEPS sample person for each setting of care is constructed (Machlin and Zodet, 2007).

The NHIS is an annual household survey conducted on a rolling basis throughout the year in which each household is interviewed once. NHIS respondents are asked questions about the frequency of health care visits in the past 12 months classified into the following nine response categories: none, 1, 2-3, 4-5, 6-7, 8-9, 10-12, 13-15, and 16 or more. Ambulatory health care utilization is captured through two separate questions; one on frequency of visits to a doctor or other health care professional in a doctor's office, clinic, or some other place; and the other on how many times the respondent has gone to an emergency department (Machlin and Zodet, 2007).

The actual data collection of the NAMCS is carried out by the physician aided by his/her office staff. A daily listing of all patient visits during the assigned reporting week are recorded on patient record forms. The sampling procedure was designed so that about 30 patient record forms are completed during the assigned reporting week (http://www.cdc.gov/nchs/ahcd/about_ahcd.htm).

For the NHAMCS patient visits are systematically selected over a randomly assigned four week reporting period. A visit is defined as a direct, personal exchange between a physician, or a staff member operating under a physician's direction, for the purpose of seeking care and rendering health services. Forms were developed for outpatient and emergency department visits. (http://www.cdc.gov/nchs/ahcd/about_ahcd.htm).

2.2 Target Populations

The surveys examined in this paper do not have the same target populations. The NHIS (and MEPS as a subsample of the NHIS) collects information on health care use for the civilian non-institutionalized population residing in the United States. Unlike MEPS and NHIS, household surveys, the NAMCS and NHAMCS collect data on a sample of visits to sampled health care providers. NAMCS and NHAMCS cover visits made by persons outside the civilian non-institutionalized population (e.g. residents of institutions, the military and homeless persons) (Machlin et al, 2001).

2.3 Covered Settings and Providers

The NAMCS and NHAMCS are limited with regard to settings and provider types. Specifically, the 2007 NAMCS sampling frame was composed of all physicians who provide office-based care. The physicians included were principally engaged in patient care activities; non-federally employed, and not in the specialties of anesthesiology, pathology, and radiology (Machlin et al 2001). The 2007 NHAMCS was a national probability sample of visits to the emergency and outpatient departments of noninstitutional general and short-stay hospitals. Included were hospitals with an average length of stay for all patients of less than 30 days or hospitals whose specialty was general or children's general. Excluded were Federal and military hospitals, VA hospitals, hospital units of institutions, and hospitals with less than six beds (http://www.cdc.gov/nchs/ahcd/about_ahcd.htm).

2.4 Admissions from Emergency Rooms

Emergency room visits that are immediately followed by a hospital admission could be viewed as "non-ambulatory" and thus the extent to which these events are captured may vary among the surveys. NHIS and NHAMCS include emergency department visits that

result in a hospital admission while MEPS only captures these events when respondents identified and reported them separately from the hospital stay (Machlin et al, 2001).

2.5 Analytic Approach

In this analysis, we compare national estimates across the different surveys for the total number of ambulatory visits in 2007 in three settings of care: office-based, hospital outpatient, and emergency department. To make more appropriate comparisons, we excluded telephone contacts from MEPS because these events are not included in the NHIS, NAMCS and NHAMCS (Machlin et al. 2001).

MEPS estimates were computed from public use files prepared by the Agency for Healthcare Research and Quality (AHRQ), while those for NHIS, NAMCS, and NHAMCS were computed from public use files prepared by the National Center for Health Statistics (NCHS). Differences between survey estimates noted are statistically significant at the $p < 0.05$ level.

3. Results

3.1 MEPS versus NHIS

3.1.1 Distribution of Non-emergency Ambulatory Visits, 2007

In comparing estimates of the distribution of visits, MEPS annual data were grouped into the nine NHIS question categories listed in the methods section above. In addition, office-based (OB) and outpatient department (OP) visits reported in MEPS were combined into one category to make MEPS data as comparable as possible to the NHIS data collected.

MEPS estimates of the distribution of non-emergency ambulatory visits were higher at the extremes of the distribution compared to NHIS (Table 1). While the estimated percent of persons with no ambulatory visits was significantly higher in MEPS (27.0 percent) than NHIS (17.7 percent), the percent with a greater number of visits was also significantly higher (MEPS estimates of 11.5% with 13 or more visits versus 6.7 percent for NHIS). Alternatively, the estimated proportion of persons with visits between these extremes (1-12 visits) was significantly lower in MEPS (61.7 percent) than NHIS (75.7 percent).

Table 1: Distribution of Non-emergency Ambulatory Visits, 2007
(Because of rounding, not all columns sum to 100 %)

Number of visits	MEPS (OB+OP)	NHIS
0	27.0%	17.7%*
1-12	61.7%	75.7%*
1	16.0%	18.7%
2-3	19.7%	28.5%
4-5	10.6%	14.0%
6-7	6.6%	6.4%
8-9	4.3%	3.1%
10-12	4.5%	5.0%
13+	11.5%	6.7%*
13-15	3.1%	1.9%
16+	8.4%	4.8%

*significantly different from MEPS ($p < 0.05$)

3.1.2 Distribution of Emergency Ambulatory Visits, 2007

The MEPS distribution of the number of emergency department visits was slightly lower than the NHIS distribution (Table 2). According to MEPS, 87.0 percent of the population had no emergency department visits during 2007 while NHIS estimates that 79.9 percent of persons had no emergency department visits in the 12 months preceding the 2007 interview date. The estimated percent of persons with two or more emergency department visits was about half as high in MEPS versus NHIS (3.0 percent to 7.3 percent, respectively) (Machlin and Zodet, 2007).

Table 2: Distribution of Emergency Department Visits, 2007
(Because of rounding, not all columns sum to 100 %)

Number of visits	MEPS	NHIS
0	87.0%	79.9%*
1	10.0%	12.8%
2+	3.0%	7.3%*
2-3	2.7%	5.5%
4-5	0.2%	1.0%
6-7	0.1%	0.3%
8-9	<0.1%	0.2%
10-12	<0.1%	0.2%
13-15	<0.1%	<0.1%
16+	0%	0.1%

*significantly different from MEPS (p<0.05)

3.2 MEPS versus NAMCS

3.2.1 Aligning Estimates of Total Office Based Physician Visits, 2007

In generating estimates of office based visits for MEPS and NAMCS numerous steps were taken to make MEPS as comparable as possible to the NAMCS (Table 3). For MEPS the following exclusions were made: removal of visits to non-physician offices; visits where the setting was one of the following, VA facilities, company clinics, surgical centers, and laboratory or x-ray facilities; and finally visits to radiologists, anesthesiologists, and pathologists. These exclusions resulted in totals of 1,133.3 million visits for MEPS versus 994.3 million for NAMCS.

Table 3: Aligning Estimates of Total Office Based Visits

	MEPS	NAMCS
2007 total (in millions)	1,500.5	994.3
Exclude non-physician visits	332.6	
Exclude non-office settings (VA facility, company clinic, surgical center, lab/x-ray facilities)	30.2	
Exclude non-eligible physicians (radiologists, anesthesiologists, pathologists)	4.4	
Total after exclusions	1,133.3	994.3

3.2.2 Number of Office Based Visits, 2007

While there was a significant difference between MEPS and NAMCS with respect to total visits to eligible physicians' offices (1,133.3 and 994.3 million, respectively) this was not the case when comparing visits in which a physician was actually seen (Table 4). Here the estimates were not statistically different, 939.7 million for MEPS versus 953.0 million for NAMCS. The NAMCS estimate of the subset of office based visits where a non-physician was seen (33.4 million) was significantly different from MEPS (179.2 million). Thus, the differences observed in the total number of visits to physicians' offices are largely attributable to the estimates of the number of non-physician office based visits from the two surveys.

Table 4: Number of Office Based Visits, 2007

	MEPS		NAMCS	
	Estimate in millions (SE)	Percent distribution	Estimate in millions (SE)	Percent distribution
Total after exclusions	1,133.3 (25.2)	100.0%	994.3* (45.3)	100.0%
Saw doctor	939.7	82.9%	953.0	74.4%
Saw non-doctor	179.2	15.8%	33.4*	24.2%
Unknown	14.4	1.3%	8.0	1.4%

*significantly different from MEPS (p<0.05)

3.3 MEPS versus NHAMCS

3.3.1 Aligning Estimates of Total Outpatient Department Visits

In calculating estimates of outpatient department visits for MEPS and NHAMCS a number of steps were taken to align the samples in an effort to make MEPS as comparable as possible to the NHAMCS (Table 5). For MEPS the following exclusions were made: removal of visits in VA facilities; visits to radiologists, anesthesiologists, and pathologists, and finally visits where a surgical procedure was reported as being performed during the visit. These exclusions resulted in totals of 105.9 versus 88.9 million visits (MEPS versus NHAMCS, respectively).

Table 5: Aligning Estimates of Total Outpatient Department Visits

	MEPS	NHAMCS
2007 Total (in millions)	126.2	88.9
Exclude VA facility	4.1	
Exclude non-eligible physicians (radiologists, anesthesiologists, pathologists)	1.9	
Exclude visits with surgical procedure	14.2	
Total after exclusions	105.9	88.9

3.3.2 Number of Outpatient Department Visits, 2007

While the estimate of the total number of visits, after exclusions, to outpatient departments was not significantly different between MEPS and NHAMCS (105.9 versus

88.9 million, respectively) (Table 6), the NHAMCS estimate of the subset of visits to outpatient departments where a physician was seen (66.2 million) was significantly different from MEPS (28.7 million). Additionally, the NHAMCS estimate of visits to non-physicians (21.5 million) was significantly different from MEPS (74.7 million). Thus, while estimates of the total number of outpatient department visits between the two surveys were similar the distribution of those visits between physicians and non-physicians showed marked differences.

Table 6: Number of Outpatient Department Visits, 2007

	MEPS Estimate in millions (SE)	Percent distribution	NHAMCS Estimate in millions (SE)	Percent distribution
Total after exclusions	105.9 (6.6)	100.0%	88.9 (9.6)	100.0%
Saw doctor	28.7	27.1%	66.2*	74.4%
Saw non-doctor	74.7	70.5%	21.5*	24.2%
Unknown	2.6	2.4%	1.2	1.4%

*significantly different from MEPS (p<0.05)

3.3.3 Aligning Estimates of Total Emergency Department Visits

In comparing estimates of emergency department visits for MEPS and NHAMCS several steps were taken to align the samples in an effort to make the MEPS sample as similar as possible to the NHAMCS (Table 7). For MEPS visits identified as taking place in a VA facility were excluded while for the NHAMCS visits for individuals identified as residents of a nursing home or other institution, or as being homeless were excluded. These exclusions resulted in totals of 53.3 million visits for MEPS versus 112.9 million for NHAMCS.

Table 7: Aligning Estimates of Total Emergency Department Visits

	MEPS	NHAMCS
2007 total (in millions)	53.9	116.8
Exclude VA facility	0.7	--
Exclude institutionalized, homeless	--	3.9
Total after exclusions	53.3	112.9

3.3.4 Number of Emergency Department Visits, 2007

In contrast to total outpatient department visits, the estimate from NHAMCS for total visits to emergency departments in 2007 (112.9 million) was substantially higher than emergency department estimates for MEPS (53.3 million) (Table 8). The bulk of this difference is attributable to visits where a physician is seen (101.1 million for NHAMCS versus 50.9 million for MEPS). For both MEPS and NHAMCS the percent of emergency room visits where a non-physician is reported as having been seen is relatively small (3.2 percent and 8.9 percent, respectively).

Table 8: Number of Emergency Department Visits, 2007

	MEPS		NHAMCS	
	Estimate in millions (SE)	Percent distribution	Estimate in millions (SE)	Percent distribution
Total after exclusions	53.3 (1.5)	100.0%	112.9* (7.3)	110.0%
Saw doctor	50.9	95.6%	101.1*	89.6%
Saw non-doctor	1.7	3.2%	10.0	8.9%
Unknown	0.7	1.2%	1.8	1.6%

*significantly different from MEPS (p<0.05)

4. Summary/Discussion

The comparisons carried out in this study reveal substantial variation among survey estimates of ambulatory health care use in different settings. These variations are likely due to the interaction of a number of factors, including differences in data collection methodologies, target populations, types of settings and providers covered, and reporting differences. Both of the household surveys (MEPS and NHIS) target the civilian non-institutionalized population, whereas the provider surveys, NAMCS and NHAMCS, are more inclusive and include visits from persons outside that population.

4.1 MEPS and NHIS estimates

The NHIS questions refer to the past 12 months while MEPS annual data are cumulated across three interviews with an average recall period of approximately 3-6 months. These differences may have an impact on the estimates obtained. For example, the longer NHIS recall period may make the respondents more prone to overestimation biases associated with telescoping (Bradburn, 1994). While one would reasonably expect the shorter reference period in MEPS to result in more accurate reports of utilization from respondents, respondent fatigue across multiple interviews along with the increased burden of additional questions that are associated with reported ambulatory health care visits may produce incentives for MEPS respondents to underreport visits (Machlin and Zodet, 2007).

Additionally, MEPS respondents are asked to classify ambulatory visits into three categories based on the setting of care: office based visits, hospital outpatient department visits and emergency department visits. Difficulty in differentiating those settings may contribute to the divergent survey estimates. For example, it is possible that visits reported in MEPS as having taken place in an outpatient department could be reported by a respondent in NHIS as emergency department visits since there is not a separate question for outpatient department visits within the NHIS (Machlin and Zodet, 2007).

4.2 Office Based Visits: MEPS versus NAMCS

After adjusting for known scope and coverage differences the total number of office based visits was significantly different between the two surveys. However, this difference can be totally accounted for by the observed differences in non-physician office based visits. The NAMCS estimate of physician office visits where a non-physician provider is seen is significantly smaller than the comparable estimate from the MEPS. This result is not surprising considering that MEPS is more inclusive with regard to office based visits, including visits where the office is not overseen by a physician,

e.g., a non-physician in independent practice such as chiropractors, nurse practitioners, physical therapists, and technicians (Machlin et al. 2001).

4.3 Outpatient Department Visits, MEPS and NHAMCS

The range and patterns across the surveys with regards to estimates of outpatient department visits are difficult to fully explain. However, the low NHAMCS estimates of visits to non-physicians relative to MEPS may have occurred because visits to non-physician offices are included in MEPS but may be misreported with respect to setting. If many of these types of practitioner visits were reported as visits to outpatient departments in MEPS, then this would help explain why the NHAMCS estimate of outpatient department visits to non-physicians is substantially lower than in MEPS. Also, difficulties among household respondents in distinguishing between outpatient departments and other settings for visits (e.g. emergency departments and physicians' offices) may contribute to the widely dissimilar estimates. Another factor that could possibly explain a portion of the differences observed is that NHAMCS only includes visits occurring in hospitals covered by the NHAMCS sampling frame (i.e. Non-federal, short-stay, general hospitals, and hospitals with six or more beds). These constraints do not apply to visits reported in MEPS (Machlin et al. 2001).

4.4 Emergency Department Visits, MEPS and NHAMCS

One of the most prominent differences in estimates of ambulatory care use was that the NHAMCS emergency department visit estimate was essentially twice as high as the corresponding MEPS estimate. Differences in reporting of emergency department visits immediately followed by an inpatient admission may explain a small part of this wide variation. Distinguishing an initial emergency department visit from a subsequent hospital stay may not be obvious for MEPS respondents, especially considering the emergency department visit may have been brief relative to the inpatient stay and expenses for these events obtained in MEPS are typically included in the inpatient hospital bill (Machlin et al. 2001). Also MEPS estimates could result in potential underreporting if persons who use the emergency department as their usual source of care may tend to underreport and/or misclassify some of these visits as outpatient department or office-based visits (Machlin et al. 2001). Additionally, what a household respondent in MEPS might consider to be an emergency room visit would not necessarily be consistent with how such visits are classified in the NHAMCS from the provider's perspective. For example, a hospital visit that was initiated in the emergency department but then immediately referred to another department for tests may be reported as an outpatient department visit in MEPS but counted as an emergency department visit in NHAMCS (Machlin and Zodet, 2007).

Nonetheless, these factors may not account for the entire difference between NHAMCS and MEPS. Further research is needed to better account for the observed large differences in emergency department estimates.

4.5 Summary

In summary, the surveys examined in this paper can all be used to estimate ambulatory health care utilization in the United States. However, in a number of instances they produced different estimates of ambulatory utilization. These differences are likely largely attributable to technical survey differences, covered persons and providers, settings of care, reference periods and other differences in methodology. Whether working with one or multiple data sources, it is important for researchers to assess the strengths and limitations of the particular source(s) being used, and to use caution when

interpreting and comparing estimates (Machlin et al. 2001, and Machlin and Zodet, 2007).

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