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# **An Estimation Methodology to Permit Longitudinal Cohort Analyses Based on the National Health Interview Survey and Medical Expenditure Panel Survey**

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## **ABSTRACT**

In addition to serving as the sampling frame for AHRQ's Medical Expenditure Panel Survey (MEPS), the survey integration with the National Health Interview Survey (NHIS) permits an enhanced capacity for longitudinal analyses of trends in health care utilization, coverage, access and health status. No explicit estimation strategy or estimation weights are currently provided to analysts to permit longitudinal cohort analyses using these data resources that have a standardized approach with consistent population controls. Examples of enhanced longitudinal analyses based on the NHIS-MEPS linked files include studies of the long term uninsured and the conduct of episodes of illness studies over an extended time interval. In this paper, attention will be given to enhancing an understanding of the reasons for non-linkages between the files, to articulating an estimation strategy to permit longitudinal analyses, and the development of the necessary estimation weight. In addition, a summary of the capacity of the estimates derived from the linked files to coincide with the estimates obtained directly from the respective surveys will be provided.

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## **1. Introduction**

In addition to serving as the sampling frame for AHRQ's Medical Expenditure Panel Survey (MEPS), the survey integration with the National Health Interview Survey (NHIS) permits an enhanced capacity for longitudinal analyses of trends in health care utilization, coverage, access and health status. The parallel structures of the two surveys make their integration for longitudinal analyses easier to accomplish. Both surveys are characterized by multi-stage sample designs with well specified estimation strategies for the derivation of nationally representative survey estimates. The survey estimation weights serve to adjust for sample unit selection probabilities and for survey nonresponse at the household and person levels, in addition to implementing poststratification and raking adjustments to align population estimates with more precise sources such as the Current Population Survey. Both surveys also provide users with detailed documentation of the core components of the survey design, which include sample design specifications, estimation strategies, sampling weights derivations and adjustment specifications to the survey estimation weights.

To facilitate the conduct of longitudinal cohort analyses using the NHIS and MEPS data in tandem, NHIS/MEPS linkage files have been developed. These NHIS/MEPS linkage files allow users to link persons in the MEPS public use files to the records of the same persons in the previous NHIS public use files. In addition, the documentation clarifies that only a subset of persons from the previous NHIS core person, sample adult and sample child files will match to a subset of the MEPS file. No explicit estimation strategy or estimation weights are currently provided to analysts to permit longitudinal cohort analyses using these data resources that have a standardized approach with consistent population controls. . Examples of enhanced longitudinal analyses based on the NHIS-MEPS linked files include studies of the long term uninsured and the conduct of episodes of illness studies over an extended time interval. In this paper, attention will be given to enhancing an understanding of the reasons for non-linkages between the files, to articulating an estimation strategy to permit longitudinal analyses, and the development of the necessary estimation weight. In addition, a

summary of the capacity of the estimates derived from the linked files to coincide with the estimates obtained directly from the respective surveys will be provided.

## **2. Background**

The MEPS was designed to provide annual estimates at the national level of the health care utilization, expenditures, sources of payment and health insurance coverage for the U.S. civilian non-institutionalized population. The MEPS consists of a family of interrelated surveys, which include a Household Component (HC) and a Medical Provider Component (MPC). In addition to collecting data to yield annual estimates for a variety of measures related to health care use and expenditures, MEPS provides estimates of measures related to health status, demographic characteristics, employment and access to health care. Estimates can be provided for individuals, families and population subgroups of interest. The data collected in this ongoing longitudinal study also permit studies of the determinants of the use of services and expenditures, and changes in the provision of health care in relation to social and demographic factors such as employment or income; the health status and satisfaction with health care of individuals and families; and the health needs of specific population groups such as the elderly and children.

The set of households selected for the MEPS HC is a subsample of those participating in the National Health Interview Survey (NHIS), an ongoing annual household survey of approximately 35,000 households (85,000 individuals) conducted by the National Center for Health Statistics, Centers for Disease Control and Prevention, to obtain national estimates of health care utilization, health conditions, health status, insurance coverage and access. The MEPS HC consists of an overlapping panel design in which any given sample panel is interviewed a total of 5 times in person over 30 months to yield annual use and expenditure data for two calendar years. These rounds of interviewing are spaced about 5 to 6 months apart. The interview is administered through a computer assisted personal interview (CAPI) mode of data collection, and takes place with a family respondent who reports for him/herself and for other family members. Initiated in 1996, the 2011 MEPS annual survey consists of approximately

14,000 families and 33,000 individuals, and reflects an oversample of the following policy relevant population subgroups: Hispanics, blacks, Asians and low income households. Data from two panels are combined to produce estimates for each calendar year (Cohen et al., 2009; Ezzati-Rice et al, 2006; Cohen, 2003).

### **3. Analyses Based on NHIS to MEPS Linkage**

In addition to the plethora of studies in the areas of cost, coverage, access, financing and health care quality and outcomes that have been based on MEPS data, the linkage of the MEPS to the NHIS permits the conduct of an enhanced set of analytic studies. More specifically, the health care experience of the population represented by nationally representative subsample of the NHIS at year t-1 can also be measured in year t and t+1 based on data from the MEPS. Treating the population at time t-1 as a cohort, one can assess the health status and health conditions that characterize the population at baseline based on the NHIS data, and observe subsequent patterns of health care utilization, expenditures and health outcomes at time t and t+1 based on the MEPS.

If all NHIS sample respondents were included in the MEPS with no additional subsampling, the initial MEPS estimation weight would be set to the NHIS estimation weight, to appropriately represent the U.S. civilian non-institutionalized population at baseline (time t-1). During the period of time from the NHIS interview to the first day of the calendar year that is covered by the linked MEPS, individuals who died, went into institutions, joined the military, or moved out of the country would be viewed out of scope and ineligible for the MEPS survey. Further adjustments to the estimation weights would be required to adjust for survey nonresponse in the MEPS and to allow for poststratification to population control totals for a subsequent time period.

Due to the selective disproportional sampling scheme that is applied to the NHIS in the specification of MEPS sample, the estimation strategy developed to facilitate national estimates based on the MEPS-NHIS linkage must account for this additional phase of sampling. Other complexities arise when these MEPS linked analyses are

dependent on the data in the NHIS sample adult or sample child data files. Again, adjustments for survey attrition over time and poststratification to more accurate population control totals would be required.

For analyses using the core NHIS sample, where all NHIS sample respondents are eligible for analysis, MEPS Panel weights have been developed to reflect both the probability of selection into the NHIS sample and the subsequent disproportionate selection probabilities used to selected the MEPS sample. These MEPS panel specific estimation weights also include adjustments for survey attrition over time and poststratification and raking adjustments to more accurate population control totals. In addition to excluding NHIS survey respondents who went out of scope during the period of eligibility prior to the period covered by the MEPS, these estimation weights allow for the representation of individuals who were out of scope at the time of the NHIS, but who have subsequently entered the population during the period of eligibility covered by the MEPS.

To illustrate the strategy under consideration for the development of estimation weights to permit longitudinal cohort type analyses using data from the NHIS and the MEPS, data from the 2007 MEPS linked to the 2006 was utilized. Table 1 provides a summary of the linkage status between the 2006 NHIS Person File and the 2007 Full Year file restricted to Panel 12. In the 2007 MEPS Panel 12 file, there were 13,688 sample respondents (both key and non-key), of which 12,260 linked to the 2006 NHIS. The 1,428 individuals that were new to the MEPS sample in 2007 consisted of newborns; individuals returning to the population who were in institutions, the military or out of the country in 2006; and a set of individuals who were in scope in 2006 that joined MEPS households (non-key individuals with 0 person weights, included in family level analyses).

Table 1: Linkage status between the 2006 NHIS Person File and the 2007 MEPS Annual File Restricted to Panel 12

		2007 MEPS Panel 12	2006 NHIS not in 2007 MEPS Panel 12
2006 NHIS person file (n=75,716)	In NHIS	12,260	63,456
	In Sample Adult File	4,102	20173
	Not in Sample Adult File	8,158	43,283
MEPS only	Not in NHIS	1,428	

**Source:** Center for Financing, Access, and Cost Trends, AHRQ, Household Component of the Medical Expenditure Panel Survey, 2007; National Health Interview Survey, NCHS, 2006 .

Based on the estimation strategy used to develop the 2007 MEPS Panel 12 weight, WTP12P07F, the sum of these MEPS weights across all MEPS respondents will represent the U.S. civilian non-institutionalized population as of 2007. The population estimate based on this panel specific MEPS weight was 301,409,260 for 2007, which reflects all individuals who were in the population for any time in the calendar year. This would include individuals who were in the population for the entire year as well as individuals whose period of eligibility in 2007 was less than 365 days, such as newborns, decedents, movement in and out of institutions, the military and U.S. residence.

**Table 2: FY 2007 Panel 12 (n=13,688)**

	<b>N</b>	<b>Weighted pop by the Panel Weight WTP12P07F</b>	<b>N with WTP12P07F=0</b>
<b>Total</b>	13,688	301,409,260	673
<b>Not in NHIS 2006</b>	1,428	18,571,046	657
<b>In NHIS 2006</b>	12,260	282,838,213	16
<b>NHIS Population estimate for 2006</b>		(293,755,796, using NHIS weight)	
<b>NHIS Age&lt;18</b>	3,619	69,784,477	0
<b>NHIS Age 18+</b>	8,641	213,053,736	16
<b>Not in Sample Adult file</b>	8,158	179,044,120	15
<b>In Sample Adult file</b>	4,102	103,794,094	1

**Source:** Center for Financing, Access, and Cost Trends, AHRQ, Household Component of the Medical Expenditure Panel Survey, 2007; National Health Interview Survey, NCHS, 2006 .

Based on the estimation weights available in the NHIS person file, the 2006 population estimate was 293,755,796. The MEPS sample for 2007 was selected from the NHIS sample representing the first two quarters of 2007. Consequently, the only persons who would be classified as out of scope for subsequent cohort analyses were those individuals who were part of the U.S. civilian non-institutionalized population at the time of the NHIS interview who subsequently left the population prior to 2007. This group would include decedents, those institutionalized, entries into the military and movers out of the country. Given the small window time in 2006 that represents the period between the NHIS interviews in the first two quarters of 2006 and the end of the calendar year, it is estimated that less than 2.0 million individuals, eligible at the time of the NHIS interview went out of scope prior to 2007. More specifically, the annual number of deaths in the U.S. for the entire population is 2.4 million, and a subset of this total is attributable to deaths that occur in nursing homes, the military, prisons and other

institutions. Consequently, it is estimated that less than 1.2 million deaths for the MEPS eligible population occurred between the time of the NHIS interview and 1/1/2007 (Arialdi et al., 2009). Similarly, the number of admissions to nursing homes that occur during this time period is estimated to be less than 600,000. The remainder of MEPS eligible individuals that went out of scope as a consequence of movement into other institutions, the military and out of the country is substantially less than a population estimate of 200,000.

While the estimate of the population at the time of the NHIS that was based on the MEPS Panel specific estimation weight for this 2006 population cohort (282,838,213, S.E. = 8.3M) did not differ statistically from the expected estimate when testing at the .05 level of significance, it was clear that an additional adjustment to external control totals would improve the resultant estimation capacity for planned cohort analyses (Table 2). By using the 2006 NHIS population control totals as the standard for a subsequent poststratification or raking source, the modest level error in the population estimates derived for cohort analyses would be substantially lower than reliance on the MEPS panel specific estimation weight without a subsequent adjustment.

To implement the additional adjustments to the MEPS Panel weight WTP12P07F, the following variables were considered in the specification of a raking adjustment to the 2006 population controls available from the NHIS 2006 person file (n=75,456, pop=293,755,796): sex, Hispanic origin, Race (white only; black only; AIAN only; Asian only; other or multiple race), Age (0-4, 5--17, 18-29, 30-44,45-64, 65+), Region, Health status (excellent; very good; good and DK; fair; poor) and health insurance coverage at the time of the interview (covered; not covered and DK). The resultant estimation weight to permit planned NHIS-MEPS cohort analyses is referred to as RALLPWTA.

### **3.1 Evaluation of the MEPS cohort adjusted weight on national health related estimates derived from the NHIS**

The linkage of the MEPS to the NHIS permits a related set of analyses to be conducted to discern the impact of the adjustment to the MEPS estimation weights on national estimates derived from the NHIS. The MEPS and NHIS linked design permits appending the health related data profiles collected in the NHIS for the prior year to the responding MEPS sample. Using the NHIS data in concert with the restricted sample of MEPS respondents permits the derivation of NHIS national health related estimates for the prior year based on a subsample characterized by a lower response rate. With this design feature, the NHIS national estimates derived from the MEPS sample may be compared to the national estimates obtained from the full NHIS, prior to its linkage to MEPS. Consequently, this targeted analysis serves to permit a direct assessment of the effect of adjustments to the MEPS estimation weights for survey attrition, poststratification and raking. When viewed in this light, the findings from these analyses reveal the capacity and degree of MEPS sample design, nonresponse and post-stratification adjustment strategies to yield comparable national estimates of the NHIS health related measures under investigation that align with the estimates produced off the full NHIS for the prior year.

As the initial baseline interview for the MEPS, the NHIS cross-sectional interview is characterized by a household survey response rate that exceeds 85%. Given the nationally representative nature of the subsample of the NHIS used for the MEPS each year, one should be able to produce national health, health care utilization, access and health insurance coverage estimates using the NHIS measures for the reserved MEPS subsample (prior to the conduct of MEPS interviews) that are convergent with the estimates obtained from the full sample NHIS. Alternatively, national estimates based on the same NHIS measures from the linked MEPS survey will be characterized by a response rate subject to additional rounds of interviewing and associated sample attrition. A comparison of the health care related estimates based on the NHIS variables derived from the sample restricted to MEPS with those obtained from the full sample NHIS

national estimates permits an assessment of the impact of survey attrition and associated estimation weight adjustments for sub-sampling, nonresponse and post-stratification on the resultant health care related estimates. Only a very small degree of departure in the convergence of these estimates would be expected to be attributable to NHIS sample ineligibility in the subsequent year in MEPS due to death, institutionalization and movement out of the country (Cohen et al, 2007; Cohen and Rhoades, 2007; Cohen et al. 2006).

To facilitate this analysis, the following NHIS measures of health, health care utilization, access, coverage and demographics were selected in support of these analyses (Adams et al., 2008):

- Any limitation? (limited in any way ; Not limited in any way; Unknown if limited)-LA1AR
- Limitation of activity by chronic condition status: Not limited in any way; limited; caused by at least one chronic condition; limited; not caused by chronic condition; limited; unknown if condition is chronic)- LACHRONR
- DURING THE PAST 12 MONTHS, have you delayed seeking medical care because of worry about the cost? (yes; no; refused/not ascertained/DK) - PDMED12M ;
- DURING THE PAST 12 MONTHS, was there any time when you needed medical care, but did not get it because you/the family couldn't afford it? (yes; no; refused/not ascertained/DK) - PNMED12M ;
- Have you been hospitalized OVERNIGHT in the past 12 months? (yes; no; refused/not ascertained/DK) – PHOSPY2 ;
- During the past 12 MONTHS did you receive care from doctors or other health care professionals 10 or more times? Do not include telephone calls. (yes; no; refused/not ascertained/DK) – P10DVYR;
- Medicare coverage at time of interview-MEDICARE
- Medicaid coverage at time of interview-MEDICAID
- Private coverage at time of interview-PRIVATE

- Amount family spent for medical care: ( 0; Less than \$500; \$500 - \$1,999; \$2,000 - \$2,999; \$3,000 - \$4,999; \$5,000 or more; Refused ; Not ascertained; Don't know)- HCSPFYR
- Mention of Private health insurance: (Mentioned; Not mentioned; Refused; Not ascertained; Don't know) –HIKINDA
- Born in the United States : ( Yes; No: Refused: Not ascertained; Don't know)-PLBORN
- U.S. citizenship status: ( Yes; No: Refused: Not ascertained; Don't know)-CITIZENP

Table 3: Unweighted and weighted counts for NHIS 2006 Persons and MEPS P12 linked persons

		NHIS Persons					MEPS P12 linked persons				
		N	Wt N by WTFA	SE	Pct	SE	N	Wt N by RALLPWTA	SE	Pct	SE
TOTAL		75,456	293,755,796	4,414,548	100.00	0.00	12,244	293,755,796	6,328,787	100.00	0.00
LA1AR	1 Limited in any way	8,768	35,776,474	780,953	12.18	0.20	1,478	35,149,840	1,157,078	11.97	0.33
LA1AR	2 Not limited in any way	66,498	257,223,328	3,953,461	87.56	0.21	10,732	258,011,239	5,757,065	87.83	0.33
LA1AR	3 Unknown if limited	190	755,994	101,833	0.26	0.03	34	594,718	108,686	0.20	0.04
LACHRONR	0 Not limited in any way (incl unk)	66,688	257,979,322	3,955,937	87.82	0.20	10,766	258,605,956	5,762,339	88.03	0.33
LACHRONR	1 Limited; caused by at least one	8,420	34,411,473	761,493	11.71	0.20	1,413	33,490,005	1,119,858	11.40	0.32
LACHRONR	2 Limited; not caused by chronic	152	616,699	57,120	0.21	0.02	31	816,606	145,154	0.28	0.05
LACHRONR	3 Limited; unk if cond is chronic	196	748,302	70,127	0.26	0.02	34	843,229	153,832	0.29	0.05
PDMED12M	1 Yes	5,619	22,963,225	628,211	7.82	0.17	977	23,868,582	1,024,798	8.13	0.31
PDMED12M	2 No	69,588	269,892,053	4,065,706	91.88	0.18	11,237	269,189,163	5,924,346	91.64	0.32
PDMED12M	7 Refused	134	499,143	98,448	0.17	0.03	14	332,210	151,553	0.11	0.05
PDMED12M	9 Don't know	115	401,375	90,291	0.14	0.03	16	365,841	205,486	0.13	0.07
PNMED12M	1 Yes	4,264	16,923,790	512,687	5.76	0.15	768	18,536,252	860,442	6.31	0.27
PNMED12M	2 No	70,917	275,865,527	4,163,146	93.91	0.15	11,448	274,611,411	6,051,313	93.48	0.29
PNMED12M	7 Refused	145	541,435	108,192	0.18	0.04	14	332,210	151,553	0.11	0.05
PNMED12M	9 Don't know	130	425,044	78,635	0.15	0.03	14	275,923	184,769	0.09	0.06
PHOSPYR2	1 Yes	5,883	23,803,605	486,855	8.10	0.13	1,021	25,219,749	935,057	8.59	0.28
PHOSPYR2	2 No	69,076	267,942,499	4,102,729	91.21	0.15	11,164	266,735,519	5,910,876	90.80	0.30
PHOSPYR2	7 Refused	394	1,633,125	211,419	0.56	0.07	40	1,247,616	233,068	0.43	0.08
PHOSPYR2	9 Don't know	103	376,567	80,680	0.13	0.03	19	552,912	243,334	0.19	0.08
P10DVYR	1 Yes	6,694	27,926,522	585,524	9.51	0.15	1,153	29,639,854	995,074	10.09	0.27
P10DVYR	2 No	68,189	263,566,336	4,064,487	89.72	0.18	11,032	262,418,419	5,758,542	89.33	0.29
P10DVYR	7 Refused	321	1,327,923	184,543	0.45	0.06	24	732,798	123,466	0.25	0.04
P10DVYR	9 Don't know	252	935,015	118,596	0.32	0.04	35	964,725	253,979	0.33	0.09
MEDICARE	1 Yes, information	9,065	38,554,712	898,663	13.13	0.24	1,476	38,626,486	1,312,712	13.15	0.39
MEDICARE	2 Yes, but no information	40	150,069	32,008	0.05	0.01	7	190,451	83,854	0.07	0.03
MEDICARE	3 No	65,438	251,689,633	3,920,202	85.68	0.25	10,658	252,028,474	5,722,514	85.80	0.43
MEDICARE	7 Refused	402	1,568,330	148,911	0.53	0.05	39	1,333,635	278,207	0.45	0.09
MEDICARE	8 Not ascertained	5	7,258	5,701	0.00	0.00	0	0	0	0.00	0.00
MEDICARE	9 Don't know	506	1,785,794	141,751	0.61	0.05	64	1,576,750	285,258	0.54	0.10
MEDICAID	1 Yes, information	9,405	30,443,650	854,327	10.36	0.24	1,806	29,039,667	1,521,073	9.89	0.47
MEDICAID	2 Yes, but no information	205	687,705	93,214	0.23	0.03	32	650,187	185,814	0.22	0.06
MEDICAID	3 No	64,963	259,356,992	3,993,979	88.29	0.25	10,305	261,267,355	5,750,452	88.94	0.48
MEDICAID	7 Refused	399	1,555,181	148,023	0.53	0.05	40	1,351,847	280,133	0.46	0.09
MEDICAID	8 Not ascertained	5	7,258	5,701	0.00	0.00	0	0	0	0.00	0.00
MEDICAID	9 Don't know	479	1,705,010	138,908	0.58	0.05	61	1,446,739	282,745	0.49	0.10
PRIVATE	1 Yes, information	44,883	188,239,138	3,128,560	64.08	0.42	7,009	191,346,059	4,781,784	65.14	0.76
PRIVATE	2 Yes, but no information	300	1,184,485	151,776	0.40	0.05	56	1,344,111	260,425	0.46	0.09
PRIVATE	3 No	29,391	101,071,964	1,912,090	34.41	0.41	5,078	98,267,040	2,981,854	33.45	0.76
PRIVATE	7 Refused	398	1,547,941	147,470	0.53	0.05	40	1,351,847	280,133	0.46	0.09
PRIVATE	8 Not ascertained	5	7,258	5,701	0.00	0.00	0	0	0	0.00	0.00
PRIVATE	9 Don't know	479	1,705,010	138,908	0.58	0.05	61	1,446,739	282,745	0.49	0.10
HCSPFYR	0 Zero	7,873	26,492,621	813,683	9.02	0.25	1,249	23,701,222	1,273,501	8.07	0.41
HCSPFYR	1 Less than \$500	28,511	107,477,540	1,999,994	36.59	0.42	4,834	113,326,130	3,146,769	38.58	0.73
HCSPFYR	2 \$500 - \$1,999	21,609	87,626,539	1,799,685	29.83	0.38	3,561	87,643,141	2,828,475	29.84	0.68
HCSPFYR	3 \$2,000 - \$2,999	5,923	24,524,998	843,213	8.35	0.24	980	25,315,670	1,404,395	8.62	0.43
HCSPFYR	4 \$3,000 - \$4,999	3,777	16,100,331	569,855	5.48	0.18	603	15,348,730	1,028,194	5.23	0.35
HCSPFYR	5 \$5,000 or more	3,323	14,352,279	566,287	4.89	0.18	496	13,503,900	1,165,213	4.60	0.38
HCSPFYR	7 Refused	1,331	5,434,174	369,645	1.85	0.13	120	3,962,688	587,111	1.35	0.20
HCSPFYR	8 Not ascertained	2	8,518	8,518	0.00	0.00	0	0	0	0.00	0.00
HCSPFYR	9 Don't know	3,107	11,738,796	567,926	4.00	0.19	401	10,954,316	1,249,422	3.73	0.41
HIKINDA	1 Mentioned	45,516	190,319,832	3,137,198	64.79	0.42	7,111	193,615,407	4,874,470	65.91	0.76
HIKINDA	2 Not mentioned	29,057	100,168,515	1,949,270	34.10	0.42	5,032	97,341,803	2,905,724	33.14	0.75
HIKINDA	7 Refused	399	1,555,181	148,023	0.53	0.05	40	1,351,847	280,133	0.46	0.09
HIKINDA	8 Not ascertained	5	7,258	5,701	0.00	0.00	0	0	0	0.00	0.00
HIKINDA	9 Don't know	479	1,705,010	138,908	0.58	0.05	61	1,446,739	282,745	0.49	0.10
PLBORN	1 Yes	61,109	252,593,016	4,019,093	85.99	0.29	9,979	253,453,113	5,720,740	86.28	0.46
PLBORN	2 No	13,832	39,356,113	960,542	13.40	0.29	2,231	39,431,256	1,524,316	13.42	0.45
PLBORN	7 Refused	479	1,689,893	182,080	0.58	0.06	30	797,743	204,530	0.27	0.07
PLBORN	8 Not ascertained	4	8,888	5,390	0.00	0.00	0	0	0	0.00	0.00
PLBORN	9 Don't know	32	107,886	28,572	0.04	0.01	4	73,683	29,180	0.03	0.01
CITIZENP	1 Yes, citizen of the United States	66,914	270,545,705	4,168,779	92.10	0.23	10,896	271,651,177	6,010,172	92.48	0.39
CITIZENP	2 No, not a citizen of the United S	7,703	20,523,782	687,642	6.99	0.21	1,271	20,418,391	1,174,161	6.95	0.38
CITIZENP	7 Refused	695	2,331,091	196,303	0.79	0.07	58	1,391,820	297,005	0.47	0.10
CITIZENP	8 Not ascertained	6	14,575	7,835	0.01	0.00	2	24,518	24,518	0.01	0.01
CITIZENP	9 Don't know	138	340,643	50,625	0.12	0.02	17	269,890	71,575	0.09	0.02

**Source:** Center for Financing, Access, and Cost Trends, AHRQ, Household Component of the Medical Expenditure Panel Survey, 2007.

Table 3 provides a summary of these national estimates of health, health care utilization, access, coverage and demographics derived from the full sample NHIS for calendar year 2006, for the overall population. National estimates of these prior year NHIS measures from the MEPS are derived from the MEPS full year responding sample linked to the prior year NHIS. The MEPS full year sample is affected by three rounds of survey attrition following the NHIS interview. As can be observed from a review of the comparisons of the MEPS-based prior year NHIS health and healthcare related estimates and the full NHIS generated estimates, only a negligible number of significant differences in estimates (other than for missing values) are evident, when testing at an alpha level of .05. Similar findings were observed when testing the capacity of the MEPS subsample to reproduce prior year NHIS citizenship and place of birth estimates. Taken together, the results present no evidence of bias attributable to survey attrition, poststratification or raking affecting these national health care and access estimates when subject to the more restrictive response rate experience in MEPS.

### **3.2 Evaluation of MEPS cohort adjusted weight on national health related estimates derived from the MEPS**

Table 4 provides a summary of the national estimates of health care expenditure, utilization, sources of payment, insurance and income derived from the MEPS for calendar year 2007, for the cohort of individuals that were represented in the population in 2006. The estimates appear as the first set presented in the columns, using MEPS Panel 12 cohort adjusted weight. In addition, 2007 estimates of the same measures representing the same cohort of individuals identified in 2006 are derived from the MEPS using the unadjusted MEPS Panel 12 weight (presented in the next set of columns) for the same 12,244 NHIS-MEPS sample respondents. The final sets of estimates are based on the full 2007 MEPS subsample, further restricted to represent the cohort of individuals that were members of the civilian non-institutionalized population in 2006. The MEPS full year

person weight on the expenditure file is used to derive estimates for this representation of the cohort.

To facilitate this analysis, the following MEPS measures of health care expenditures, health care utilization, coverage and income were selected to support of these analyses:

- Total health care expenditures in 2007 – TOTEXP07;
- Percent of the population with no health care expenditures in 2007- ZERO\_TOTEXP
- Person's total income in 2007-TTLP07X
- Percent with no income in 2007- ZERO\_TTPL
- Total amount paid by private insurance in 2007-TOTPRV07
- Percent of the population with no health care expenditures paid by private coverage in 2007- ZERO\_TOTPRV
- Total amount paid by self or family in 2007- TOTSLF07
- Percent of the population with no health care expenditures paid by self/family in 2007- ZERO\_TOTSLF
- Total health care expenditures for office based visits in 2007 – OBDEXP07;
- Percent of the population with no office based visit health care expenditures in 2007- ZERO\_OBDEXP
- Total number of office based visits in 2007 – OBDRV07;
- Percent of the population with no office based visits in 2007- ZERO\_OBDRV
- Total health care expenditures for inpatient stays in 2007 – IPTEXP07;
- Percent of the population with no inpatient health care expenditures in 2007- ZERO\_IPTEXP
- Total number of nights in hospital for discharges in 2007 – IPNGTD07;
- Percent of the population with no nights in hospital in 2007- ZERO\_IPNGTD

- Percent of the population with health insurance coverage on 12/31/07-INS07X
- Percent of the population with private health insurance coverage in 2007-PRIVAT07

Table 4: Use, Expenditure and insurance estimates in 2007 for the 2006 population cohort

		2007 MEPS Panel 12 estimates for the 2006 population cohort with RALLPWTA>0 (n=12,244)				2007 MEPS Panel 12 estimates for the 2006 population cohort (n=12,244)				2007 MEPS combined panels estimates for a 2006 population cohort (Panel 11, n=16,086; Panel 12 with RALLPWTA>0, n=12,244)			
		weighted by RALLPWTA				weighted by panel wt WTP12P07F				weighted by PERWT07F			
		n	wt. n	Mean or Pct	SE	n	wt. n	Mean or Pct	SE	n	wt. n	Mean or Pct	SE
TOTEXP07		12,244	293,755,796	3,913.30	121.68	12,244	282,838,213	3,882.43	117.24	28,330	290,442,358	3,789.96	88.94
ZERO_TOTEXP (%)				15.08	0.52			14.88	0.51			15.08	0.34
TTLP07X				26,235.84	492.27			26,735.04	504.49			26,435.92	310.44
ZERO_TTLP (%)				26.89	0.60			26.52	0.59			27.32	0.36
TOTPRV07				1,627.52	65.20			1,646.07	64.76			1,579.81	65.20
ZERO_TOTPRV (%)				44.31	0.96			43.50	0.95			43.41	0.62
TOTSLF07				627.63	16.26			628.85	15.91			617.58	12.71
ZERO_TOTSLF (%)				22.50	0.66			22.24	0.65			22.91	0.42
OBDEXP07				655.20	21.76			656.52	21.65			599.43	16.67
ZERO_OBDEXP (%)				35.07	0.65			34.93	0.65			34.35	0.44
OBDRV07				3.06	0.06			3.05	0.06			3.19	0.04
ZERO_OBDRV (%)				34.18	0.67			34.06	0.66			33.39	0.44
IPTEXP07				1,120.17	72.77			1,102.90	71.20			1,174.14	59.53
ZERO_IPTEXP (%)				92.70	0.26			92.77	0.26			92.65	0.19
IPNGTD07				0.46	0.04			0.45	0.04			0.51	0.03
ZERO_IPNGTD (%)				92.77	0.26			92.84	0.25			92.71	0.18
INS07X (%)	1 Yes			80.50	0.72			81.20	0.70			81.79	0.42
	2 No			19.50	0.72			18.80	0.70			18.21	0.42
PRIVAT07 (%)	1 Yes			62.43	0.97			63.38	0.95			63.48	0.60
	2 No			37.57	0.97			36.62	0.95			36.52	0.60

**Source:** Center for Financing, Access, and Cost Trends, AHRQ, Household Component of the Medical Expenditure Panel Survey, 2007.

As can be observed from a review of the comparisons of the 2007 specific estimates that characterize alternative methods of representing a cohort of the 2006 U.S. civilian non-institutionalized population in a subsequent year, no significant differences in mean or percent estimates are evident, when testing at an alpha level of .05. The standard errors of the survey estimates have been adjusted for the impact of clustering due to the multistage survey design, and the test statistics used to test for equivalence in estimates have also been adjusted to control for survey design complexities. The results serve to demonstrate that mean estimates of core healthcare measures based on the new

Panel 12 cohort adjusted weight (adjusted to population controls based on the 2006 NHIS) are consistent with those produced from the unadjusted MEPS Panel 12 estimation weights for the same cohort. The same holds true for comparisons to estimates based on a larger sample representation of a 2006 population cohort into 2007 using the full 2007 MEPS. The appeal of the use of the Panel cohort adjusted weight becomes more apparent when estimates of population totals, rather than means are of concern. In absolute terms, the population estimate of 293.8M for the 2006 cohort derived from the NHIS control totals is substantially more accurate than the unadjusted MEPS survey based population estimate of 282.8M. While the convergence of population estimates of total expenditures or utilization measures may be demonstrated based on statistical tests attributable to sampling error, the improved estimate of the overall population cohort more visibly carries over to improve the integrity of resultant survey estimates.

#### **4. Analyses Based on MEPS Linkage to the NHIS Sample Adult and Sample Child Files**

Within each family in the NHIS, one sample adult and one sample child (if any children are present) are randomly selected and information on each is collected with the Sample Adult Core and the Sample Child Core questionnaires. Both questionnaires collect basic information on health status, health care services, and health behaviors. In the previous NHIS sample designs prior to 2006, all eligible adults in a family had the same chance of being selected as the sample adult. A new feature of the current NHIS sample design is that adults aged 65+ who are black, Hispanic, or Asian have an increased chance of being selected as the sample adult, relative to adults aged under 65 and adults aged 65+ who are not black, Hispanic, or Asian.

As indicated, MEPS Panel weights have been developed to reflect both the probability of selection into the NHIS core sample and the subsequent disproportionate selection probabilities used to selected the MEPS sample. However, these MEPS estimation weights do not reflect the additional level of sub-sampling in the NHIS necessary to restrict the administration of the NHIS Sample Adult Core and Sample Child

Core questionnaires to a single adult and child (if existent in the family). Consequently, to permit linked analyses between the NHIS and the MEPS using the sampled adult and/or the sampled child NHIS analytic files to represent the health related experience of a cohort of adults or children in the population as of 2006, the MEPS panel specific weights need to reflect the additional adjustments for the within-family sub-sampling adopted in the NHIS. In the remainder of this section, the estimation strategy employed to incorporate the NHIS within family sub-sampling methodology in the adjusted MEPS estimation weights to support NHIS linked analyses will be illustrated for the NHIS sampled adult file applications, but the same methodology would apply for sampled child applications.

In the 2006 NHIS sample adult file, there were 24,275 adults aged 18 and over sub-sampled from the core NHIS sample of 54,553 adults. Using the NHIS sample adult estimation weight, WTFA\_SA, the population estimate of adults in 2006 was 220,266,693. If  $W(i)$  is the estimation weight of an adult that is part of the core NHIS sample, specified as the inverse of their selection probability, and that same individual was sub-sampled to be administered the sample adult questionnaire with probability  $P(i)$ , then their estimation weight would be further adjusted by this selection probability in the following manner:

$$WA(i) = W(i)/P(i)$$

Using this relationship, the subsampling probability can be expressed as

$$P(i) = W(i)/WA(i)$$

Consequently, one can derive the probability of an individual's selection as a sample adult in the NHIS,  $PA(i)$  by taking the ratio of the sample adult's estimation weight on the NHIS core file, WTFA, and the sample adult's estimation weight on the NHIS sample adult file, WTFA\_SA, whereby,

$$PA(i) = WTFA / WTFA\_SA.$$

In the 2007 MEPS, there were 4,101 individuals with positive estimation weights linked to the 2006 NHIS sample adult file. To permit comparable cohort type longitudinal analyses on detailed health related measures across NHIS and MEPS as described above for a cohort of adults that is initiated in 2006, the MEPS Panel 12 weight WTP12P07F needs to include a further adjustment to reflect the NHIS probabilities of selection for sub-sampling of adults. This adjustment to the 2007 MEPS Panel 12 weight was specified in the following manner:

$$PWTA(i) = WTP12P07F / PA(i) = WTP12P07F / (WTFA / WTFA\_SA)$$

Table 5 provides a summary of national population estimates of demographic and health related measures for individuals aged 18 or older in 2006 that are derived from (1) the NHIS core person level file, (2) the NHIS sample adult file, and (3) the MEPS subsample of adults ages 19+ in 2007 linked to the 2006 NHIS sample adult file whose Panel 12 estimation weights were further adjusted as described above for within family NHIS sub-sampling. More specifically, the following measures were considered: sex; Hispanic origin (ORIGIN\_I); race (RACERPI2); age (AGECAT); region; health status (PHSTAT); health insurance coverage at time of interview (NOTCOV); family size (FM\_SIZE); number of children in the family (KID\_SIZE); ever told by a doctor you had cancer (CANEV).

Table 5: Unweighted and weighted counts in 2006 NHIS Person and Sample Adult Files

Demo		Persons age 18+ in the Person File		Sample Adults Wt by NHIS Sample Adult Weight-WTFA_SA		Sample Adults linked to MEPS Panel 12, Wt by MEPS Adjusted Weight-PWTA	
		N	Wt. N	N	Wt. N	N	Wt. N
SEX	MALE	25,725	106,250,747	10,715	106,252,219	1,785	104,483,846
SEX	FEMALE	28,828	114,013,032	13,560	114,014,474	2,316	117,000,146
Total		54,553	220,263,779	24,275	220,266,693	4,101	221,483,992
ORIGIN_I	Hispanic	11,348	28,663,415	4,227	28,663,833	697	29,990,986
ORIGIN_I	Non-Hispanic	43,205	191,600,364	20,048	191,602,860	3,404	191,493,005
RACERPI2	01 White only	41,325	179,665,665	18,275	179,456,431	3,022	182,533,463
RACERPI2	02 Black/African American	8,395	26,282,717	4,110	26,222,945	758	25,099,107
RACERPI2	03 AIAN only	401	1,549,488	196	1,783,532	25	1,089,027
RACERPI2	04 Asian only	3,646	10,014,246	1,349	10,066,183	244	10,254,656
RACERPI2	05 Race group not rele	81	273,321	27	231,391	2	99,846
RACERPI2	06 Multiple race	705	2,478,342	318	2,506,211	50	2,407,893
AGECAT	age 18-24	7,015	28,405,897	2,670	28,386,880	412	27,538,543
AGECAT	age 25-34	9,984	39,102,172	4,429	39,280,096	766	38,944,977
AGECAT	age 35-44	11,009	42,881,340	4,651	42,723,631	780	43,246,612
AGECAT	age 45-54	10,616	42,951,880	4,450	43,054,734	771	45,049,641
AGECAT	age 55-64	7,539	31,334,714	3,428	31,147,923	595	30,993,243
AGECAT	age 65+	8,390	35,587,776	4,647	35,673,429	777	35,710,975
REGION	1 Northeast	9,531	40,367,859	4,151	39,033,183	661	39,596,348
REGION	2 Midwest	11,113	50,246,210	5,303	51,565,416	939	50,196,304
REGION	3 South	20,224	81,881,690	9,254	83,510,919	1,578	84,363,464
REGION	4 West	13,685	47,768,020	5,567	46,157,175	923	47,327,876
PHSTAT	1 Excellent	15,367	63,962,107	6,625	63,793,642	1,094	67,496,288
PHSTAT	2 Very good	16,778	69,727,824	7,537	70,580,456	1,263	69,934,951
PHSTAT	3 Good	15,281	59,427,428	6,636	58,612,396	1,140	59,301,543
PHSTAT	4 Fair	5,289	20,094,938	2,606	20,492,059	436	17,826,640
PHSTAT	5 Poor	1,663	6,264,431	853	6,611,741	164	6,547,620
PHSTAT	Don't know	175	787,051	18	176,399	4	376,950
NOTCOV	1 Not covered	10,472	36,808,494	4,316	37,691,926	717	33,498,719
NOTCOV	2 Covered	43,383	180,811,933	19,858	181,594,407	3,371	187,008,369
NOTCOV	9 Don't know	698	2,643,352	101	980,360	13	976,904
FM_SIZE	1	8,662	38,599,534	7,619	42,167,292	1,232	45,678,683
FM_SIZE	2	17,373	74,157,202	7,532	74,454,104	1,292	76,829,168
FM_SIZE	3	10,009	39,586,761	3,564	38,271,989	621	41,101,041
FM_SIZE	4	9,687	36,932,646	3,183	35,816,806	539	33,900,432
FM_SIZE	5	4,853	18,076,664	1,427	17,268,214	227	13,355,931
FM_SIZE	6	2,243	7,611,788	596	7,340,897	111	5,863,510
FM_SIZE	7	973	3,016,061	221	2,982,508	53	3,317,328
FM_SIZE	8	370	1,173,134	77	1,009,425	16	675,356
FM_SIZE	9	155	520,071	27	484,221	7	521,109
FM_SIZE	10+	228	589,918	29	471,237	3	241,433
FM_KIDS	0	32,074	136,571,974	15,828	137,841,138	2,600	143,890,749
FM_KIDS	1	9,265	35,149,216	3,409	33,808,378	569	32,649,158
FM_KIDS	2	8,094	30,231,049	3,131	30,225,803	559	28,359,229
FM_KIDS	3	3,314	12,214,087	1,258	12,299,744	232	11,058,071
FM_KIDS	4	1,253	4,307,415	468	4,352,223	99	3,960,834
FM_KIDS	5	342	1,161,638	121	1,187,010	27	1,099,831
FM_KIDS	6+	211	628,400	60	552,397	15	466,119
CANEV	1 Yes			1,739	15,819,631	300	15,819,594
CANEV	2 No			22,505	204,175,296	3,798	205,553,246
CANEV	Don't know			31	271,766	3	111,152

**Source:** Center for Financing, Access, and Cost Trends, AHRQ, Household Component of the Medical Expenditure Panel Survey, 2007; National Health Interview Survey, NCHS, 2006.

A close review of the estimates derived by the three alternative methods indicates a general convergence in estimates across the alternative samples to represent the population of adults in 2006. As already noted in MEPS, the only adults who would be classified as out of scope for subsequent cohort analyses were those individuals who were part of the U.S. civilian non-institutionalized population at the time of the NHIS interview who subsequently left the population prior to 2007. While the estimate of the population at the time of the NHIS that was based on the MEPS Panel specific estimation weight for this 2006 population cohort of adults (221,483,992) did not differ statistically from the NHIS based population control total (220,266,693) when testing at the .05 level of significance, it was clear that an additional adjustment to external control totals would improve the resultant estimation capacity for planned cohort analyses of adults. By using the 2006 NHIS population control totals as the standard for a subsequent post-stratification or raking source, the modest level error in the population estimates derived for cohort analyses would be substantially lower than reliance on the MEPS panel specific estimation weight without a subsequent adjustment.

To implement the additional adjustments to the MEPS Panel weight adjusted for NHIS sample adult sub-sampling, WTPA, the following variables were considered in the specification of a raking adjustment to the 2006 population controls available from the NHIS 2006 sample adult file (n=24,275, population = 220,266,693): sex, Hispanic origin, Race (white only; black only; AIAN only; Asian only; other or multiple race), Age (0-4, 5--17, 18-29, 30-44,45-64, 65+), Region, Health status (excellent; very good; good and DK; fair; poor), health insurance coverage at the time of the interview (covered; not covered and DK); ever told by a doctor you had cancer (yes; no/DK). The resultant estimation weight to permit planned NHIS-MEPS cohort analyses is referred to as RPWTA.

## **5.1 Evaluation of the MEPS cohort adjusted sample adult weight on national health related estimates derived from the MEPS**

Table 6 provides a summary of the national estimates of health care expenditure, utilization, sources of payment, insurance and income derived from the MEPS for calendar year 2007, for the cohort of adults that were represented in the population in 2006. The estimates appear as the first set presented in the columns, using MEPS Panel 12 cohort and sample adult adjusted weight RPWTA for the 4,100 adults linked to the NHIS sample adult file and age 19+ in 2007. In addition, 2007 estimates of the same measures representing the same cohort of individuals identified in 2006 are derived from the MEPS using the unadjusted MEPS Panel 12 weight (presented in the next set of columns) for the full set of 8,807 NHIS-MEPS adult respondents not restricted to the sample adults. The final sets of estimates are based on the full 2007 MEPS subsample, further restricted to represent the cohort of adults that were members of the civilian non-institutionalized population in 2006. The MEPS full year person weight on the expenditure file is used to derive estimates for this representation of the cohort.

To facilitate this analysis, same set of MEPS measures of health care expenditures, health care utilization, coverage and income used in the full NHIS-MEPS cohort evaluation were selected to support of these analyses for the population restricted to a cohort of adults. As can be observed from a review of the comparisons of the 2007 specific estimates that characterize alternative methods of representing a cohort of the 2006 adult U.S. civilian non-institutionalized population in a subsequent year, no significant differences in mean or percent estimates are evident, when testing at an alpha level of .05. Once again, the results serve to demonstrate that mean estimates of core healthcare measures based on the new Panel 12 adult cohort adjusted weight (adjusted for NHIS adult sub-sampling and to population controls based on the 2006 NHIS) are consistent with those produced from the unadjusted MEPS Panel 12 estimation weights for a comparable cohort. The same holds true for comparisons to estimates based on a larger sample representation of a 2006 population cohort into 2007 using the full 2007 MEPS.

Table 6: Use, Expenditure and insurance estimates in 2007 for the 2006 adult population cohort

		2007 MEPS Panel 12 estimates for the 2006 adult population cohort with RPWTA>0 (n=4,100)				2007 MEPS Panel 12 estimates for the 2006 adult population cohort (n=8,807)				2007 MEPS combined panels estimates for a 2006 adult population cohort (Panel 11 and Panel 12)			
		weighted by RPWTA				weighted by Panel wt WTP12P07F				weighted by PERWT07F			
		n	wt. n	Mean or Pct	SE	n	wt. n	Mean or Pct	SE	n	wt. n	Mean or Pct	SE
TOTEXP07		4,100	220,239,848	4,700.14	190.29	8,744	215,434,734	4,607.52	129.39	20,080	219,395,705	4,605.19	108.73
ZERO_TOTEXP (%)				13.68	0.77			14.64	0.52			15.02	0.34
TTLP07X				35,703.27	913.29			34,939.52	629.92			34,823.07	394.39
ZERO_TTLP (%)				6.13	0.41			6.63	0.31			6.85	0.21
TOTPRV07				1,951.59	126.62			1,962.58	83.12			1,908.81	85.03
ZERO_TOTPRV (%)				41.31	1.12			41.57	0.87			41.70	0.56
TOTSLF07				775.11	27.73			739.67	18.67			734.19	15.41
ZERO_TOTSLF (%)				17.34	0.81			18.45	0.52			19.04	0.37
OBDEXP07				787.74	44.23			778.34	27.02			714.53	21.41
ZERO_OBDEXP (%)				31.56	0.98			33.72	0.66			33.60	0.45
OBDRV07				3.55	0.10			3.46	0.07			3.60	0.05
ZERO_OBDRV (%)				30.71	0.99			33.01	0.67			32.83	0.45
IPTEXP07				1,262.31	121.54			1,370.88	90.48			1,499.96	77.44
ZERO_IPTEXP (%)				91.35	0.51			91.19	0.33			90.85	0.24
IPNGTD07				0.52	0.05			0.55	0.04			0.65	0.03
ZERO_IPNGTD (%)				91.38	0.51			91.24	0.32			90.90	0.23
INS07X (%)	1 Yes			79.02	0.92			79.74	0.70			80.02	0.42
	2 No			20.98	0.92			20.26	0.70			19.98	0.42
PRIVAT07 (%)	1 Yes			64.07	1.06			65.17	0.86			65.34	0.53
	2 No			35.93	1.06			34.83	0.86			34.66	0.53

Source: Center for Financing, Access, and Cost Trends, AHRQ, Household Component of the Medical Expenditure Panel Survey, 2007.

## 5. Summary

The MEPS was specifically designed for longitudinal analyses over two consecutive calendar years. The use of the NHIS data in concert with the data collected for the MEPS provides an additional capacity for longitudinal analyses not otherwise available as well as the consideration of analyses of population cohorts over time. Examples of enhanced longitudinal analyses based on the NHIS-MEPS linked files include studies of the long term uninsured over 4 consecutive years; consideration of extended longitudinal health and health care profiles in predicting future health care expenditures; and the conduct of episodes of illness studies over an extended time interval. Viewed in this light, the results presented in this paper should help serve to

improve the utility of the NHIS-MEPS linkage to permit these types of analyses and related longitudinal cohort studies.

In the first section of the paper, a summary of the cross-sample MEPS-NHIS linkages and non-linkage is provided for a typical year in the administration of these ongoing surveys. Attention is also given to providing explanations and clarifications for the reasons for non-linkages between the surveys. Here, an emphasis is placed on the consideration of estimation issues that need to be addressed to permit cohort studies. These types of longitudinal cohort analyses treat the population at the time of the NHIS administration as a baseline, with follow-up data on their health care experience, status and outcomes obtained from the MEPS.

By their nature, cohort studies are restricted those individuals measured at time  $t-1$  in the NHIS that include subsequent observations at time  $t$  and  $t+1$  in the MEPS. To facilitate such analytical efforts, a summary of the development of the essential estimation weights is also provided. Separate estimation weights have been developed to permit cohort analyses using health and health care related data acquired from the NHIS core interview and from the health condition-centric NHIS sample adult interview. Recognizing a small level of error implicit in the small loss in cohort at time  $t-1$  for individuals that go out of scope by time  $t$  when the window of time is less than six months, there should be, nonetheless, general convergence in the population characteristics. Our findings serve to demonstrate that this criterion holds, whereby national estimates of health, health care utilization, access, coverage and demographics derived from the full sample NHIS for calendar year 2006 for the overall population and for sampled adults were reproduced by the NHIS-MEPS cohort weights which were based on significantly greater sample size restrictions and lower response rates. Similarly, comparable national estimates of health care use and expenditures derived from a representative cohort of the 2006 U.S. civilian non-institutionalized population overall and for adults in a subsequent year based upon the full two panel 2007 MEPS sample were reproduced by the NHIS-MEPS cohort weights with their greater sample size restrictions.

In recognition of the capacity of the NHIS-MEPS survey integration to support cohort studies of this type, the 2011 MEPS will include an oversample of individuals with cancer in order to study characteristics of cancer survivorship over time. This framework for conducting longitudinal cohort studies will serve this targeted investigation of cancer survivorship well. Future efforts will be directed toward implementing further refinements to the NHIS-MEPS cohort estimation strategy that covers the two year window that defines the MEPS period of survey eligibility.

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