Event Reporting in the Medical Expenditure Panel Survey (MEPS)

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Abstract

MEPS is a nationally representative survey of U.S. civilian households. Respondents are asked about their medical conditions and insurance coverage as well as their healthcare utilization and expenses through five rounds of interviews covering a two-year period. Annual estimates for the U.S. noninstitutionalized population are made by combining the data from the panel in its first year with the one in its second. This research examines the level of reporting of medical events between the two years and five rounds of the survey. An assessment of the impact of differential reporting is made on the annual MEPS utilization and expenditure estimates using simulation.

Key Words: survey quality, response accuracy, panel survey, simulation

1. Introduction and Background

Medical utilization and expenditures are an increasingly important public health policy issue in the United States. The Medical Expenditure Panel Survey (MEPS) can be used to estimate medical utilization and expenses for the U.S. civilian non-institutionalized population. Each year since 1996, a new panel of households has been selected from the participants in the prior year's National Health Interview Survey (NHIS), an annual national probability survey conducted by the National Center for Health Statistics. For instance, the 1996 (MEPS Panel 1) sample was selected from the 1995 NHIS respondents, and the 1997 (MEPS Panel 2) sample was selected from the 1996 NHIS respondents. MEPS respondents are interviewed up to five times (rounds) to collect information about their health care over a two-year period. Figure 1 shows the MEPS panel and round design. The thin blue lines represent the starting and ending dates for each round, the earliest round begin date and last round end date among all persons in the round; the thicker sections in different colors represent the dates between which 50% of the respondents had started and ended the round, respectively. Additional details of the MEPS sample design have been previously published (Ezzati-Rice et al, 2008).

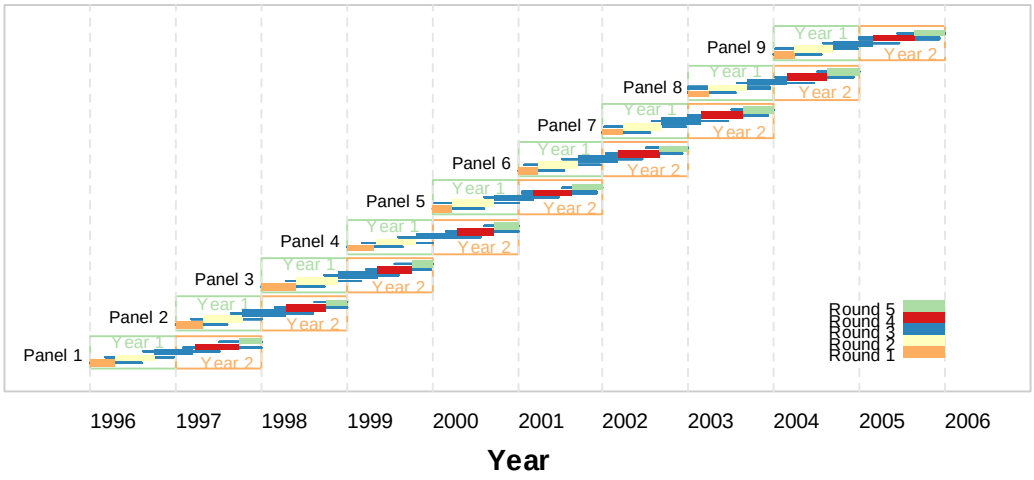

Figure 1: MEPS Panel and Round Design

As each NHIS sample is nationally representative, each MEPS panel is also nationally representative. National level expenditure and utilization estimates can be produced using data from only one MEPS panel, and in 1996, that was the

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case. After 1996, however, MEPS national estimates have been produced from data pooled between the two panels in the field during the year. The 1997 estimates, for example, were derived from data pooled between the 2nd year data from Panel 1 and the 1st year data from Panel 2. This design has the advantage of increasing sample sizes and to increase the power of annual estimates especially; however, it has the potential of introducing other sources of error. Previous research has shown that respondents generally report fewer events in the 2nd year of the survey. In any single year, the difference between 1st and 2nd year estimates is not statistically significant. Still, the pattern persisting year after year, panel after panel suggests the differences should be investigated.

MEPS' estimates of expenditures are periodically benchmarked against the National Healthcare Expenditures Account, (NHEA, Bureau of Economic Analysis, US Department of Commerce). In 2002, MEPS national expenditure estimates were lower than comparable estimates produced from the NHEA by almost 14% (Sing et al, 2006).

This research examines MEPS event reporting by round of the MEPS. MEPS events include visits to office-based doctors, hospital inpatient, outpatient and emergency room departments, dental and home health visits and prescription drug purchases. As shown in Figure 2, the average number of events reported per 120 days in the survey is lower after the first round. An assessment of the impact of this differential event reporting on the MEPS national estimates is made using simulation.

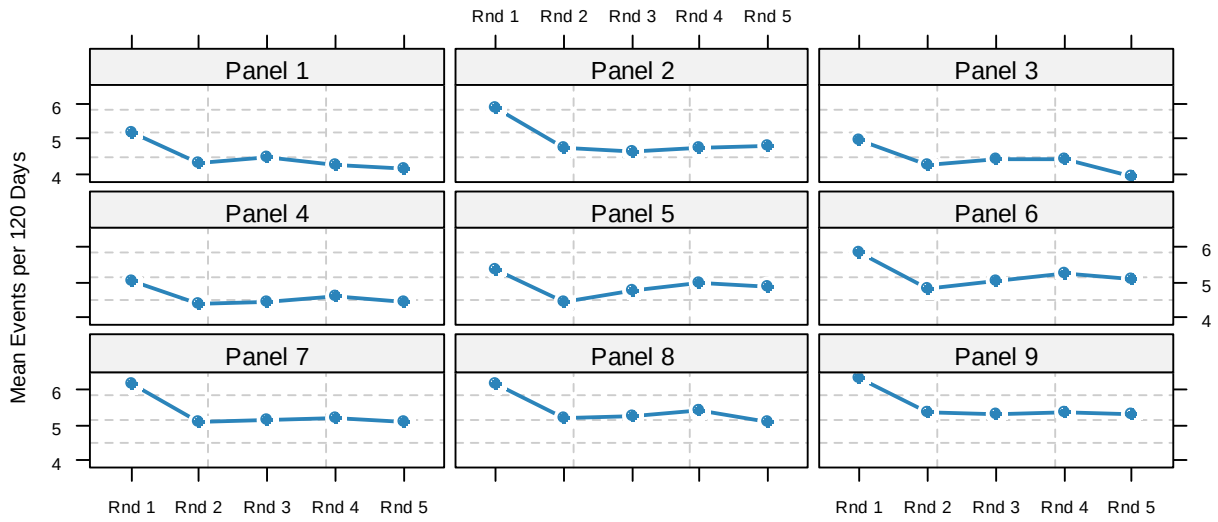

Figure 2: MEPS Event Reporting by Panel and Round

2. Methods

To simulate the effect of differential reporting, a model was first developed to represent MEPS event reporting by round and then the model was adjusted to remove the effects of the rounds. In effect, the adjusted model set the rate of event reporting in each round to that of round 1. The effect of differential reporting was estimated by the difference in the predicted number of total events and expenditures by these two models.

Because the distribution of reported events was highly skewed—the majority of respondents reported no events, many reported only a few events and very few reported many events—and the number of events reported by the same person across the different rounds was highly correlated, two different linear mixed-effects models were used to represent event reporting. The first model predicted whether any events were reported; the second predicted the conditional mean [log-transformed] number of events, that is, the mean number of events among persons with at least one event. Both models contained random effects for the survey respondents to account for the within-person correlation of

reported events, and both contained the following fixed effects: round (5 levels), panel (9 levels), age and age squared, sex, race/ethnicity (Hispanic, Nonhispanic Black, other), Census region (Northeast, Midwest, South, West), metropolitan statistical area location (yes, no), insurance coverage (some private insurance in the round, no private but some public insurance, and no insurance in the round), self-perceived health status (excellent, very good, good, fair and poor), family poverty level (below poverty, poor, near poor, middle income, high income), and binary indicators for whether the respondent reported any medical conditions in the round as well as whether anybody else in the same responding unit reported any medical conditions in the round. The models also contained interaction effects between survey round and the following: survey panel, age, race/ethnicity, region, MSA status, insurance coverage, self-perceived health status, and any medical conditions.

Due to computational memory limitations, the models were run on a $1/10^{th}$ sample of data containing approximately 68,500 person rounds. An assessment of the fit of the model was made by comparing the predicted values to the actual mean values in the other 9 $1/10^{th}$ samples. To obtain the predicted total number of events, the predicted mean number of events per day in the round was multiplied by the number of days each person was in the round and summed across all persons in the round. The annual national-level estimates of events (medical utilization) were obtained by summing the total number of events in the rounds across year for each person, multiplying that product by the person's annual survey weight, and summing across all persons in the year. Annual national-level expenditure estimates were obtained by applying the average expenditure per event per year and panel to each event before taking the weighted sum.

3. Results

As shown in Table 1, the percent of respondents who reported events and the conditional mean number of reported events varied significantly by round and the various socio-demographic groups in the models. In general, respondents were less likely to report events in rounds 3 and 5. Additionally, Hispanics, males, those living in non MSA areas, those living in the West, the uninsured, those with better perceived health status, and those in the lower poverty status categories were less likely to report events; and with the exception of the lower poverty status groups, these same respondents tended to report fewer events. The effect of age on event reporting was j-shaped; that is, the likelihood of reporting an event initially decreased with age from age 0 until about age 10, then both the likelihood and the conditional mean increased with age until 85+.

Table 1: Correlates of MEPS Event Reporting

	Pct w/ events	Conditional Mean *		Pct w/ events	Conditional Mean *		Pct w/ events	Conditional Mean *
Panel			**Age**			**Insurance status**		
1	60	6.8	0-5	60	3.4	Private	65	6.5
2	61	6.5	6-9	50	3.4	Public only	64	9.2
3	56	6.5	10-19	49	3.6	Uninsured	34	5.0
4	59	6.4	20-44	52	5.6	**Poverty status**		
5	60	6.8	45-64	71	9.2	Below poverty	54	8.1
6	62	7.0	65-74	85	12.0	Poor	53	7.6
7	59	7.2	75-84	89	13.3	Near poor	54	7.5
8	61	7.4	85+	88	11.6	Middle income	60	6.7
9	60	8.1	**Race/ethnicity**			High income	69	6.5
Round			Hispanic	46	5.4	**Region**		
1	65	8.8	Nonhispanic Black	54	7.2	Northeast	65	7.2
2	68	6.9	Other	68	7.4	Midwest	66	7.1
3	53	5.0	**Health Status**			South	59	7.3
4	68	7.3	Excellent	51	3.8	West	55	6.4
5	54	8.9	Very Good	58	5.3	**MSA status**		
Sex			Good	63	7.7	MSA	64	7.8
Male	54	6.3	Fair	79	12.8	Non MSA	59	6.8
Female	66	7.5	Poor	91	18.3			

* Mean number of reported events (among persons reporting 1 or more events) per 120 days in the round.

Figures 3 and 4 show the actual vs. model predicted mean per person and total number of reported events, respectively, on the 1/10th sample that was used to model the data. As can be seen, the combined models fit the data rather well. The comparisons between the actual and predicted mean values in the other 1/10th samples is not shown; however, in all samples the predicted values followed above or below the actual mean values more or less the same as they did in this sample. This suggests the study model adequately represents MEPS event reporting.

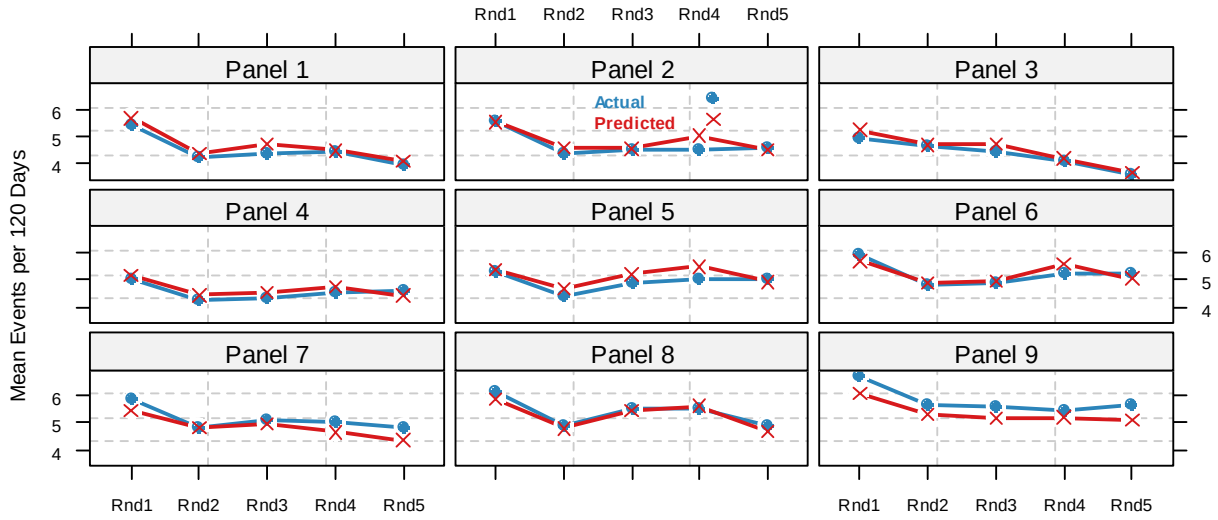

Figure 3: Actual vs. Model-Predicted Mean Number of Events per Person on 1/10th Sample

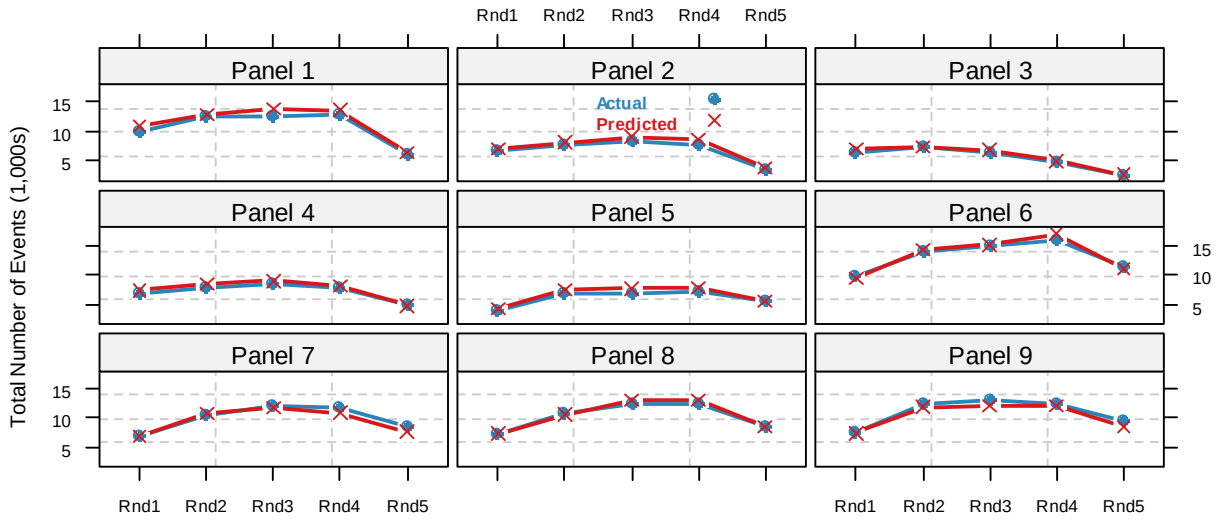

Figure 4: Actual vs. Model-Predicted Total Number of Events on 1/10th Sample

Table 2 and Figure 5 show the impact of differential event reporting on the national estimates of utilization and expenditures. When holding event reporting to the round 1 levels in all rounds, as the adjusted models do, utilization is 16% higher in the 1st year of panel 1, and 23% higher in the 2nd year of panel 1. Differential reporting appeared to have the least impact in Panel 4, where the adjustment is only 6% and 9% higher in the 1st and 2nd year, respectively. It

appears to have the greatest impact in Panel 8, where the adjustment is 17% and 22% higher in the 1st and 2nd year, respectively. Due to the manner expenditures were estimated, the impact of adjusting for differential reporting on expenditures is almost identical to the impact on utilization.

Table 2: Estimated Impact of Adjustment on Weighted (National) Estimates

Panel	Panel Year	Total Events (billions)			Expenditures (billions)		
		Modeled	Adjusted	Differential	Modeled	Adjusted	Differential
1	1: 1996	3.7	4.3	16%	542	629	16%
	2: 1997	2.1	2.6	23%	301	370	23%
2	1: 1997	2.1	2.3	13%	316	359	14%
	2: 1998	2.1	2.5	17%	308	361	17%
3	1: 1998	2.4	2.5	4%	365	380	4%
	2: 1999	1.9	2.0	6%	291	310	7%
4	1: 1999	2.0	2.2	9%	313	341	9%
	2: 2000	2.3	2.4	6%	357	380	6%
5	1: 2000	1.7	2.0	15%	258	298	16%
	2: 2001	1.7	1.9	9%	255	279	9%
6	1: 2001	2.7	3.1	14%	447	510	14%
	2: 2002	2.9	3.6	14%	479	545	14%
7	1: 2002	2.0	2.2	13%	349	395	13%
	2: 2003	2.7	3.2	19%	463	552	19%
8	1: 2003	2.1	2.5	17%	381	444	17%
	2: 2004	2.6	3.2	22%	456	556	22%
9	1: 2004	2.3	2.6	14%	443	504	14%
	2: 2005	2.9	3.4	18%	568	670	18%

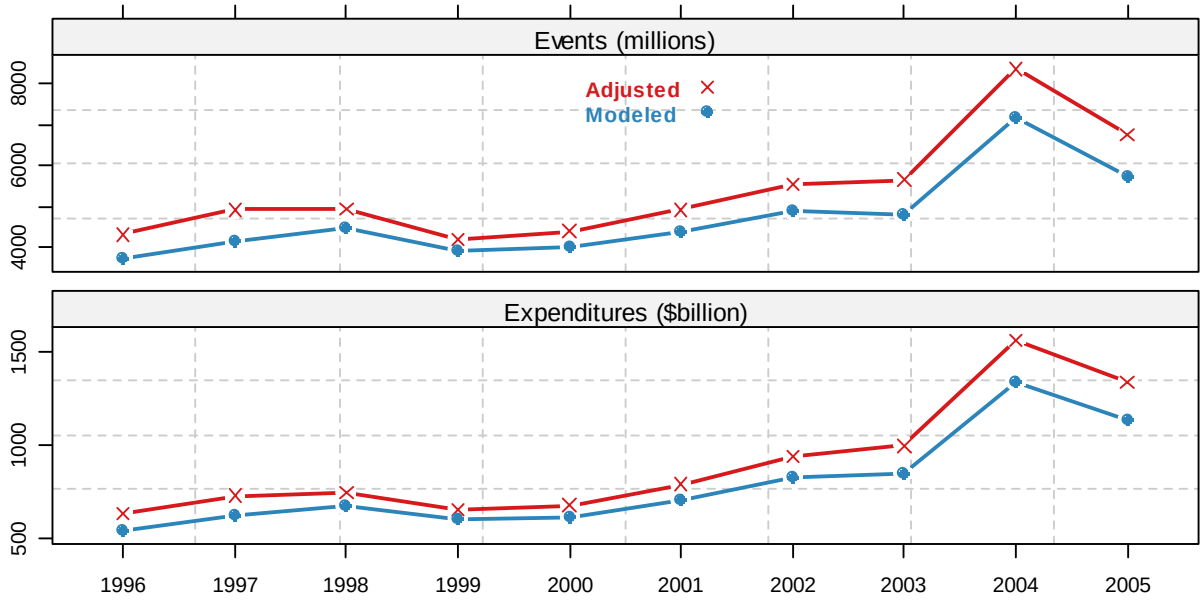

Figure 5: Model Predicted and Adjusted Annual Total Events and Expenditures

Summary

Differential event reporting, such as a change in the number of events reported by MEPS respondents after the 1st round, has the potential to impact MEPS national utilization and expenditure estimates. If there were no differential reporting, the national estimates of medical utilization and expenditures would increase by as little as 4% to 6% (2000) or by as much as 17% to 19% (2003). Interestingly, in 2002, the year in which the MEPS was benchmarked against the NHEA, the increase was between 13% and 14%. This difference is exactly what other researchers reported to be the difference between the MEPS and the benchmarked NHEA expenditure estimates.

The relatively large impact of differential reporting on expenditure estimates is likely overstated in this analysis due to the manner expenditures were attributed to the modeled and model adjusted events. In this analysis, each event was given the same expenditure amount—the average expenditure per event across all events in the same year and panel. In reality, the expenditure per event can be significantly different depending on the type of event. MEPS collects utilization and expenditure information on inpatient, outpatient, emergency room, and office-based doctor visits, as well as prescription drug purchases. The vast majority of events reported in the MEPS are prescription drug purchases, and these, on average, have a much lower expenditure amount than the other types. The correlates of event reporting may also be different depending on the event type as well. These issues should be examined in future research.

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