**Attachment P** -- Non-response Bias Analysis of Private Establishments from the 2014 Medical Expenditures Panel Survey – Insurance Component (MEPS-IC)

### **Introduction:**

When an expected unit response rate is below 80 percent, OMB Standards & Guidelines for Statistical Surveys recommends conducting a nonresponse bias analysis. Of the 42,055 sample units selected for the 2014 MEPS-IC, 27,226 (64.7%) responded, 11,776 (28.0%) did not respond, and 3,053 (7.3%) were out of sample or out of business. Removing the out of sample and out of business units from the response rate calculation results in an unweighted response rate of 69.8 percent. As shown in the formula below, nonresponse bias is a function of both the nonresponse rate and the difference between the respondent mean and the nonrespondent mean on the variable of interest:

$$\overline{Y}_r = \overline{Y}_n + \left(\frac{m}{n}\right) \left[\overline{Y}_r - \overline{Y}_m\right]$$

# Respondent Mean = Full Sample Mean + (Nonresponse Rate)\*(Respondent Mean -Nonrespondent Mean)

In the MEPS-IC we are most concerned about nonresponse bias in our key estimates- the percent of establishments offering health insurance, the percent of employees offered health insurance and the percent of employees enrolled in health insurance, among other important estimates. Unfortunately, since we do not have these estimates for the nonresponding establishments, we cannot directly measure the potential nonresponse bias in these estimates. However, from the sampling frame we have data for both responding and nonresponding establishments that are correlated with, or vary by, many of our key estimates. These variables include the size of the firm the establishment is in (number of employees), the industry group the establishment belongs to and the region of the country where the establishment is located (Census division). This analysis will compare the responding establishments to the nonresponding establishments on these sampling frame variables, using both a chi-square test of independence and a t-test to test differences in means and percentages.

The rest of this memo includes three sections where the differences between responding and nonresponding establishments will be tested and discussed, followed by a discussion of the weighting adjustments for nonresponse bias and a conclusion section.

#### Firm Size:

Firm size is highly correlated with at least one of our key measures, the percentage of establishments that offer health insurance. In 2014, 25.7 percent of private sector establishments in firms with less than 10 employees offered health insurance and this percentage increased to establishments in firms with 1,000 or more employees where 99.2 percent offered insurance. Table 1 presents the results of a chi-square test of the relationship between firm size and response. The test shows that response to the MEPS-IC is not independent of firm size and this may be a source of nonresponse bias.

To identify which firms size categories are possibly the source of this bias, table 2 shows the percent distribution of responding and nonresponding establishments across the firm size categories and the

results of testing the difference in these percentages. The results show those establishments in firms with less than 10 employees, and those with 25 to 99 employees may be a source of nonresponse bias.

#### **Industry Group:**

Most of the MEPS-IC key estimates vary by industry group. For example, in 2014 the percent of establishments that offered health insurance to their employees ranged from 23.6 percent for establishments in agriculture, fishing and forestry to 61.8 percent for those in mining and manufacturing. Table 3 presents the results of a chi-square test of the relationship between industry group and response. The test shows that response to the MEPS-IC is not independent of industry category and this may be a source of nonresponse bias.

To identify which industry category is possibly the source of this bias, table 4 shows the percent distribution of responding and nonresponding establishments across the industry categories and the results of testing the difference in these percentages. The results show those establishments in agriculture, fishing and forestry, mining and manufacturing, construction, and professional services may be a source of nonresponse bias.

#### **Census Division:**

Many of the MEPS-IC key estimates vary by Census division. For example, in 2013 the percent of employees in establishments that offered health insurance ranged from 82.0 percent for establishments located in West South Central to 88.6 percent for those located in New England. Table 5 presents the results of a chi-square test of the relationship between Census region and response. The test shows that response to the MEPS-IC is not independent of Census division and this may be a source of nonresponse bias.

To identify which Census division is possibly the source of this bias, table 6 shows the percent distribution of responding and nonresponding establishments across divisions and the results of testing the difference in these percentages. The results show those establishments located in 6 of the 9 divisions may be a source of nonresponse bias.

#### Weighting adjustments for nonresponse bias:

The base sampling weights of the respondents to the MEPS-IC are adjusted so that the respondents also represent the nonrespondents while minimizing the bias associated with nonresponse. The adjustment is made by controlling firm size, establishment size, industry group, type of firm, and state. Thus, a nonresponding establishment is represented by a responding establishment with characteristics similar to the extent possible in terms of these variables. A raking procedure is applied to adjust the weights of the respondents to represent all eligible establishments on the frame (i.e., both respondents and nonrespondents) while controlling for the marginal distributions of all these variables. The raking adjustment is expected to reduce any bias due to nonresponse to the extent the MEPS-IC estimates are associated with the characteristics used in the raking procedure. Since the MEPS-IC estimates are generally highly correlated with these characteristics, the weighting adjustment is expected to minimize the nonresponse bias to a large extent.

## **Conclusion:**

The results of this analysis show that there is the potential for nonresponse bias in the MEPS-IC. Although we never really know the extent of any bias in the survey estimates, since the distributions of responding and nonresponding establishments are close, and since the weighting adjustment takes into account the important variables by which MEPS-IC estimates mostly vary, we can be fairly confident that, to the extent possible, nonresponse bias has been addressed in the MEPS-IC.

	Table 1. Chi-Square of Response by Firm Size, 2014 MEPS-IC				
	Firm Size	Responding (N)	Nonresponding (N)	Total	
Frequency	Less than 10	2653849	1263299	3917148	
Expected		2685550	1231598		
Percent		39.96	19.02	58.98	
Row Pct		67.75	32.25		
Col Pct		58.29	60.5		
	10 to 24	550138	240744	790882	
		542219	248663		
		8.28	3.63	11.91	
		69.56	30.44		
		12.08	11.53		
	25 to 99	377294	146313	523607	
		358979	164628		
		5.68	2.2	7.88	
		72.06	27.94		
		8.29	7.01		
	100 to 999	298031	138730	436762	
		299439	137323		

	4.49	2.09	6.58
	68.24	31.76	
	6.55	6.64	
1,000 or more	673818	298987	972805
	666944	305861	
	10.15	4.5	14.65
	69.27	30.73	
	14.8	14.32	
Total	4553130	2088073	6641204
	68.56	31.44	100
Statistic	DF	Value	Prob
Chi-Square	4	4776.6482	<.0001
Cramer's V		0.0268	

Table 2. T-test of Response by Firm Size, 2014 MEPS\_IC t Pr > | Firm Size Responding (%) Nonresponding (%) DF Value t| 58.31 22377 <.0001 Less than 10 60.47 10 to 24 12.1 11.48 39000 1.76 0.0776 25 to 99 8.28 7.01 23839 4.4 <.0001 100 to 999 27276 6.54 6.65 -0.4 0.6883 14.77 14.39 1,000 or more 22425 0.98 0.328 100 Total 100

	Table 3. Chi-Square of Response by Industry, 2014 MEPS-IC			
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	Industry	Responding (N)	Nonresponding (N)	Total
Frequency	Agriculture,	118102	63347.5	181450
Expected	Fishing, and Forestry	124400	57050	
Percent		1.78	0.95	2.73
Row Pct		65.09	34.91	
Col Pct		2.59	3.03	
	Mining and	206529	83937.3	290466
	Manufacturing	199140	91326	
		3.11	1.26	4.37

	71.1	28.9	
	4.54	4.02	
Construction	362858	201415	564273
	386859	177414	
	5.46	3.03	8.5
	64.31	35.69	
	7.97	9.65	
Utilities and	137421	61984	199405
Transportation	136710	62695	
	2.07	0.93	3
	68.92	31.08	
	3.02	2.97	
Wholesale Trade	241713	114359	356072
	244119	111953	
	3.64	1.72	5.36
	67.88	32.12	
	5.31	5.48	
Financial Services	528676	237594	766270
and Real Estate	525346	240924	
	7.96	3.58	11.54
	68.99	31.01	
	11.61	11.38	
Retail Trade	643184	286023	929207
	637053	292154	
	9.68	4.31	13.99
	69.22	30.78	
	14.13	13.7	
Professional Services	1178993	507821	1686814
	1156460	530354	
	17.75	7.65	25.4
	69.89	30.11	
	25.89	24.32	
Other	1135655	531592	1667246
	1143044	524202	
	17.1	8	25.1
	68.12	31.88	
	24.94	25.46	
Total	4553130	2088073	6641204
	68.56	31.44	100
Statistic	DF	Value	Prob
Chi-Square	8	8512.2193	<.0001
Cramer's V		0.0358	

Table 4. T-test of Response by Industry, 2014 MEPS_IC							
				t	Pr >		
Industry	Responding (%)	Nonresponding (%)	DF	Value	t		
			2072				
Agriculture, Fishing, and Forestry	2.59	3.04	3	-2.44	0.0146		
			2345				
Mining and Manufacturing	4.54	4.01	5	2.4	0.0165		
			2062				
Construction	7.99	9.61	8	-5.11	<.0001		
			2229				
Utilities and Transportation	3.01	2.98	7	0.15	0.8811		
			2189				
Wholesale Trade	5.31	5.48	9	-0.7	0.4823		
			2233				
Financial Real Estate	11.59	11.42	4	0.48	0.6341		
			2243				
Retail Trade	14.11	13.74	4	0.98	0.3284		
			3900				
Professional Services	25.92	24.25	0	3.51	0.0005		
			2207				
Other	24.94	25.47	0	-1.07	0.2863		
Total	100	100					

		Table 5. Chi-Square of Response by Division, 2014 MEPS-IC				
		Division	Total			
Frequ	uenc					
У		New	240544	102128	342672	
Expe	cted	England	234932	107740		
Perce	ent		3.62	1.54	5.16	
Row	Pct		70.2	29.8		
Col P	ct		5.28	4.89		
•		Middle	587908	335436	923344	
		Atlantic	633034	290310		
			8.85	5.05	13.9	
			63.67	36.33		
			12.91	16.06		
		East	670924	289825	960749	
		North	658678	302071		

Central	10.1	4.36	14.47
	69.83	30.17	
	14.74	13.88	
West	388453	137034	525487
North	360268	165219	
Central	5.85	2.06	7.91
	73.92	26.08	
	8.53	6.56	
South	861378	416445	1277823
Atlantic	876060	401763	
	12.97	6.27	19.24
	67.41	32.59	
	18.92	19.94	
East	242474	92219.5	334693
South	229462	105231	
Central	3.65	1.39	5.04
	72.45	27.55	
	5.33	4.42	
West	480372	227581	707952
South	485364	222589	
Central	7.23	3.43	10.66
	67.85	32.15	
	10.55	10.9	
Mountain	355633	140220	495853
	339951	155902	
	5.35	2.11	7.47
	71.72	28.28	
	7.81	6.72	
Pacific	725446	347185	1072630
	735383	337248	
	10.92	5.23	16.15
	67.63	32.37	
	15.93	16.63	
Total	4553130	2088073	6641204
	68.56	31.44	100
Statistic	DF	Value	Prob
Chi-		0	0004
Square Cramor's	8	24415.1746	<.0001
Cramer's V		0.0606	
V		0.0006	

Table 6. T-test of Response by Geographic Division, 2014 MEPS\_IC

Division	Responding (%)	Nonresponding (%)	DF	t Value	Pr >  t
New England	5.3	4.85	39000	1.84	0.066
Middle Atlantic	12.92	16.07	20505	-7.97	<.0001
East North Central	14.74	13.87	39000	2.27	0.0231
West North Central	8.52	6.59	24796	6.77	<.0001
South Atlantic	18.92	19.93	21814	-2.3	0.0216
East South Central	5.33	4.41	24142	3.94	<.0001
West South Central	10.54	10.92	21901	-1.09	0.2777
Mountain	7.8	6.74	23623	3.72	0.0002
Pacific	15.93	16.62	21868	-1.68	0.0939
Total	100	100		· · · · · · · · · · · · · · · · · · ·	