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:

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

OR

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

Table 2. T-test of Response by Firm Size, 2014 MEPS_IC

Firm Size	Responding (%)	Nonresponding (%)	DF	t Value	Pr > | t |
Less than 10	58.31	60.47	22377	-4	<.0001
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	6.54	6.65	27276	-0.4	0.6883
1,000 or more	14.77	14.39	22425	0.98	0.328
Total	100	100			

Table 3. Chi-Square of Response by Industry, 2014 MEPS-IC

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

Table 4. T-test of Response by Industry, 2014 MEPS_IC					
Industry	Responding (%)	Nonresponding (%)	DF	t Value	Pr > | t |
Agriculture, Fishing, and Forestry	2.59	3.04	20723	-2.44	0.0146
Mining and Manufacturing	4.54	4.01	23455	2.4	0.0165
Construction	7.99	9.61	20628	-5.11	<.0001
Utilities and Transportation	3.01	2.98	22297	0.15	0.8811
Wholesale Trade	5.31	5.48	21899	-0.7	0.4823
Financial Real Estate	11.59	11.42	22334	0.48	0.6341
Retail Trade	14.11	13.74	22434	0.98	0.3284
Professional Services	25.92	24.25	39000	3.51	0.0005
Other	24.94	25.47	22070	-1.07	0.2863
Total	100	100			

	Table 5. Chi-Square of Response by Division, 2014 MEPS-IC			
	Division	Responding (Y)	Nonresponding (N)	Total
Frequency	New England	240544	102128	342672
Expected		234932	107740	
Percent		3.62	1.54	5.16
Row Pct		70.2	29.8	
Col Pct		5.28	4.89	
	Middle Atlantic	587908	335436	923344
		633034	290310	
		8.85	5.05	13.9
		63.67	36.33	
		12.91	16.06	
	East North	670924	289825	960749
		658678	302071	

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

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			