

# Nonresponse Bias Analysis for the Medicare Current Beneficiary Survey

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## Abstract

Survey nonresponse occurs when data are not collected for an eligible sampled individual. If non-respondents differ from respondents in meaningful ways, then nonresponse bias may occur. This paper focuses on evaluating the presence and extent of unit nonresponse bias in the Medicare Current Beneficiary Survey (MCBS). The MCBS is a continuous, multipurpose survey of a nationally representative sample of the Medicare population, conducted by the Centers for Medicare & Medicaid Services through a contract with NORC at the University of Chicago. Unlike most nonresponse bias analyses that only have limited types of data available to conduct comparisons between respondents and non-respondents, the MCBS offers a variety of measures, such as demographic characteristics, self-reported attributes, Medicare administrative Fee-For-Service payment information, and administrative chronic conditions indicators for analysis. We applied Rao-Scott chi-square tests, adjusted logistic regression models, and generalized linear models with contrast analysis to identify statistically significant differences. Using these additional measures, we found that only limited attributes would indicate bias.

**Key Words:** Medicare, survey, respondents, non-respondents, hard-to-contact respondents, attrition rate, longitudinal study, attributes, differences

## 1. Background

### 1.1 Introduction to the MCBS

The Medicare Current Beneficiary Survey (MCBS) is a continuous, in-person, multipurpose survey of a nationally representative sample of the Medicare population, conducted by the Centers for Medicare & Medicaid Services (CMS) through a contract with NORC at the University of Chicago. The survey covers a variety of topics, including health care utilization and expenditures, all sources of health insurance coverage, and health status and functioning. Beginning with data collected in 2013, a public use file (PUF) and accompanying documentation is available free for download on the [MCBS PUF page](#). Additionally, two key sets of data from the MCBS are available through Limited Data Set (LDS) files: annual, person-level Survey File and Cost Supplement data.

### 1.2 Analysis Background and Definitions

The MCBS uses a rotating panel sample design and represents the population of beneficiaries in the 50 states, the District of Columbia, and Puerto Rico. Each sampled beneficiary is scientifically selected as part of an annual panel and is interviewed up to three times, or “rounds” (Fall, Winter, Summer), per year for four consecutive years to form a continuous profile of their health care experiences. One panel is retired during

each summer round, and a new panel is selected to replace it each fall round. Panels in their first round of interviewing are called “incoming” panels; panels in their second through twelfth round are called “continuing” panels. Sampled beneficiaries may be living in the community (e.g., their homes) or a facility (e.g., nursing homes).

The MCBS employs a three-stage cluster sample design. Primary sampling units (PSUs), consisting of metropolitan areas or groups of rural counties, are selected at the first stage. Secondary sampling units (SSUs), consisting of census tracts or groups of tracts within selected PSUs, are selected at the second stage. Ultimate sampling units (USUs), or Medicare beneficiaries residing within selected SSUs, are selected at the third and final stage.

The sampling frame for the Medicare beneficiaries utilizes Medicare administrative enrollment data. These data are the authoritative source for all Medicare entitlement information, containing information on all individuals entitled to Medicare, including demographic information, enrollment dates, third party buy-in information, and Medicare managed care enrollment. The administrative enrollment data do not include personal income information.

For the purposes of some of these analyses, we partition respondents into two groups to compare to non-respondents. **Hard-to-contact respondents** are defined as respondents for whom at least nine contact attempts were made in the field. Approximately 10 percent of the respondents fall into the hard-to-contact category. **Other respondents** are then defined as all remaining respondents.

In this paper, we present several analyses<sup>1</sup> that were conducted to evaluate whether and how much non-response bias is evident in the MCBS. First, MCBS attrition rates across several rounds of data collection are presented to give a sense of the level of non-response to the survey. Second, respondents are compared to non-respondents on a variety of measures available for all sampled individuals. Fall 2015 respondents are compared to non-respondents based on frame data available for all beneficiaries sampled into the MCBS. A logistic regression model is also developed and analyzed as an additional means of evaluating non-response bias based on frame characteristics. Third, comparisons of Fall 2015 respondents and non-respondents using various claims payment measures are presented. Fourth, the differences between respondents and non-respondents with respect to various chronic conditions indicators are studied, all of which are available for all Medicare beneficiaries. And finally, Fall 2015 respondents are followed into subsequent rounds and compared with non-respondents to the subsequent rounds using self-reported health characteristics from the Fall 2015 questionnaire.

## 2. Research Methods and Outcomes

### 2.1 MCBS Attrition Rates

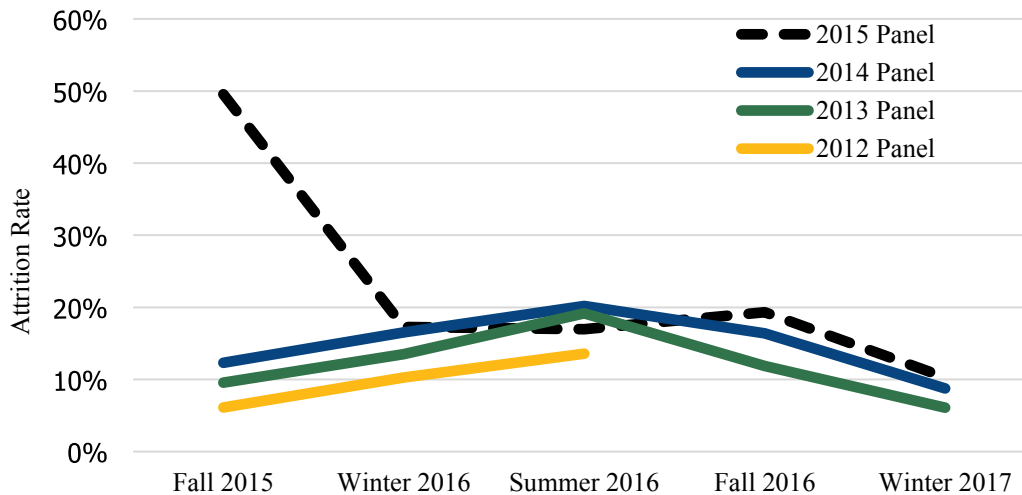
Generally, a panel is expected to experience the most attrition in its first round in data collection, and attrition is expected to decrease steadily for each panel over time. This appears to be the trend for MCBS as well, as evidenced by the trends shown in Exhibit 1.

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<sup>1</sup> Analyses presented in this report are unweighted.

This exhibit presents a visual display of attrition rates in the Fall of 2015 and into the following four rounds. The Fall 2015 Incoming Panel had a nearly 50 percent attrition rate in its first round in the field, but that attrition tapered off quickly to below 20 percent in each of the next three rounds. Once completing a first baseline interview, continuing panels had much lower attrition rates in Fall 2015, with attrition increasing slightly over the subsequent rounds before dropping again to below the Fall 2015 rate by Winter 2017. The 2012 Panel, which was retired in Summer 2016, actually saw its attrition rates increase slightly over its last few rounds in the field.

**Exhibit 1:** Unweighted Attrition Rates by Panel, Fall 2015 to Winter 2017: 2015 Survey File



## 2.2 Comparison of Respondents to Non-Respondents: Frame Characteristics

As displayed above, the response rate for the incoming 2015 Panel in Fall 2015 was about 50 percent, and the continuing panels' Fall 2015 response rates averaged around 90 percent. Both respondents and non-respondents from each panel are included in their respective frame files, from which the samples were selected. The frame files contain a variety of demographic, geographic, and other background information for all beneficiaries eligible to be sampled as part of that panel. Therefore, it is possible to compare respondents and non-respondents based on these frame characteristics. A comparison can help to detect noticeable differences between these two groups and perhaps identify areas of potential bias resulting from non-response.

Exhibit 2 displays comparisons of 2015 Incoming Panel Fall 2015 respondents to non-respondents using several of the frame characteristics, including sex, age, race/ethnicity, newly eligible status (i.e., whether the beneficiary became eligible and enrolled in Medicare during 2015), Census division, Health and Human Services (HHS) Region<sup>2</sup>, and ACO status (i.e., whether the beneficiary was enrolled in an Accountable Care Organization; ACO members were previously oversampled in the MCBS). To test

<sup>2</sup> Regions defined for the purposes of program and outreach coordination for the U.S. Department of Health and Human Services.

differences between the two populations, the Rao-Scott chi-square test was used. This test adjusts the Pearson Chi-Square statistics, using a second-order design correction, by dividing it twice by the generalized design effect factor (GDEFF). The second-order correction adjusts not only the mean of the chi-square distribution but also the variance.

Statistically significant differences between respondents and non-respondents were detected for sex, age, race/ethnicity, Census division, and HHS region. While non-respondents appear more likely to be female and older, and slightly less likely to be non-Hispanic black, the differences are not large. Large sample sizes such as those in the MCBS often result in statistically significant differences being found even when little practical difference is observed. Thus, it is important to observe the actual differences in percentages between respondents and non-respondents within variable categories to identify practical differences between the two groups.

**Exhibit 2:** 2015 Incoming Panel Respondents vs. Non-respondents in Fall 2015, by Frame Characteristics

Frame Characteristic	Fall 2015 Non- Respondents #	Fall 2015 Respondents #	Fall 2015 Non- Respondents %	Fall 2015 Respondents %
<b>Sex**:</b>				
Male <sup>a</sup>	1,828	1,976	42.8%	45.4%
Female	2,444	2,373	57.2%	54.6%
<b>Age**:</b>				
Under 45	418	420	9.8%	9.7%
45-64	212	316	5.0%	7.3%
65-69	634	615	14.8%	14.1%
70-74	685	660	16.0%	15.2%
75-79	691	784	16.2%	18.0%
80-84	748	754	17.5%	17.3%
85 and over	884	800	20.7%	18.4%
<b>Race/Ethnicity**:</b>				
Hispanic	391	409	9.2%	9.4%
Non-Hispanic White	2,977	3,030	69.7%	69.7%
Non-Hispanic Black	344	423	8.1%	9.7%
All Other	180	108	4.2%	2.5%
Missing/Unknown	380	379	8.9%	8.7%
<b>Newly Eligible:</b>				
Not Newly Eligible	3,911	3,985	91.5%	91.6%
Newly Eligible	361	364	8.5%	8.4%
<b>Census Division**:</b>				
Northeast	795	785	18.6%	18.1%
Midwest	877	1,019	20.5%	23.4%
South	1,611	1,741	37.7%	40.0%
West	989	804	23.2%	18.5%
<b>HHS Census Region**:</b>				

Frame Characteristic	Fall 2015	Fall 2015	Fall 2015	Fall 2015
	Non- Respondents #	Respondents #	Non- Respondents %	Respondents %
1: CT, MA, ME, NH, RI, VT	162	127	3.8%	2.9%
2: NJ, NY, PR	630	655	14.7%	15.1%
3: DC, DE, MD, PA, VA, WV	645	705	15.1%	16.2%
4: AL, FL, GA, KY, MS, NC, SC, TN	236	316	5.5%	7.3%
5: IL, IN, MI, MN, OH, WI	854	898	20.0%	20.6%
6: AR, LA, NM, OK, TX	300	347	7.0%	8.0%
7: IA, KS, MO, NE	416	425	9.7%	9.8%
8: CO, MT, ND, SD, UT, WY	348	354	8.1%	8.1%
9: AZ, CA, HI, NV	643	450	15.1%	10.3%
10: AK, ID, OR, WA	38	72	0.9%	1.7%
ACO Status:				
Not ACO	3,634	3,666	85.1%	84.3%
ACO	638	683	14.9%	15.7%

Source: 2015 Survey File.

<sup>a</sup>This group also includes a small number of beneficiaries with missing gender.

\*\* : Statistically significant at  $P < .01$

Exhibit 3 displays comparisons of the combined 2012 through 2014 Continuing Panel respondents to non-respondents based on the same frame characteristics. For the continuing panels, most of the distributions across the various frame variables were similar for respondents and non-respondents. The only statistically significant differences detected between respondents and non-respondents were within the age categories; the non-respondents tend to skew younger than the respondents.

**Exhibit 3:** 2012-2014 Panel Respondents vs. Non-respondents in Fall 2015, by Frame Characteristics

Frame Characteristic	Fall	Fall	Fall	Fall
	2015 Non- Respondents #	2015 Respondents #	2015 Non- Respondents %	2015 Respondents %
Sex:				
Male	479	4,308	43.9%	44.3%
Female	613	5,414	56.1%	55.7%
Age*:				
Under 45	134	831	12.3%	8.5%
45-64	91	815	8.3%	8.4%
65-69	251	2,153	23.0%	22.1%
70-74	149	1,413	13.6%	14.5%
75-79	170	1,581	15.6%	16.3%
80-84	163	1,533	14.9%	15.8%

Frame Characteristic		Fall 2015 Non- Respon- dents #	Fall 2015 Respon- dents #	Fall 2015 Non- Respon- dents %	Fall 2015 Respon- dents %
	85 and over	134	1,396	12.3%	14.4%
Race <sup>a</sup> :	Black	118	1,035	10.8%	10.6%
	Not Black	974	8,687	89.2%	89.4%
Census Division:	Northeast	194	1,859	17.8%	19.1%
	Midwest	312	2,467	28.6%	25.4%
	South	377	3,657	34.5%	37.6%
	West	209	1,739	19.1%	17.9%
HHS Census Region:	1 CT, MA, ME, NH, RI, VT	48	339	4.4%	3.5%
	2 NJ, NY, PR	139	1,420	12.7%	14.6%
	3 DC, DE, MD, PA, VA, WV	188	1,788	17.2%	18.4%
	4 AL, FL, GA, KY, MS, NC, SC, TN	124	685	11.4%	7.0%
	5 IL, IN, MI, MN, OH, WI	185	1,944	16.9%	20.0%
	6 AR, LA, NM, OK, TX	82	710	7.5%	7.3%
	7 IA, KS, MO, NE	104	922	9.5%	9.5%
	8 CO, MT, ND, SD, UT, WY	84	756	7.7%	7.8%
	9 AZ, CA, HI, NV	125	980	11.4%	10.1%
	10 AK, ID, OR, WA	13	178	1.2%	1.8%
ACO:	Not ACO	709	5,604	75.7%	76.3%
	ACO	228	1,738	24.3%	23.7%

Source: 2015 Survey File.

<sup>a</sup> Prior to 2014, the only race/ethnicity information available for beneficiaries is a Black/Not Black indicator.

\*: Statistically significant at P<.05

Next, hard-to-contact respondents were separated from other respondents. The 2015 Panel Fall 2015 non-respondents are compared to both hard-to-contact respondents and other respondents across the frame characteristics described above. Exhibit 4 presents the number and proportion of non-respondents, hard-to-contact respondents, and other respondents with each frame characteristic. Non-respondents appear to be more likely to be female (57.8 percent) compared to hard-to-contact (53.1 percent) and other (53.8 percent) respondents. There are also some noticeable differences across age and race/ethnicity, especially between hard-to-contact respondents and the other two groups. For example, the hard-to-contact respondents tend to skew younger than the non-respondents and other respondents and are more likely to be Hispanic and non-Hispanic black (and less likely to be non-Hispanic white) than the other two groups. Some statistically significant differences were detected between non-respondents and hard-to-contact respondents, and between non-respondents and other respondents. These are indicated in the top row of the percent columns for each characteristic. Again, because

the MCBS sample size is very large, these significance levels do not necessarily indicate meaningful or practical differences.

**Exhibit 4:** 2015 Panel Non-respondents (NR) vs. Hard-to-Contact Respondents (HR) and Other Respondents (OR), by Frame Characteristics: Fall 2015

Frame Characteristic	NR #	HR #	OR #	NR %	HR %	OR %
Sex:						**
Male	1,594	176	1,721	42.2%	46.9%	46.2%
Female	2,180	199	2,001	57.8%	53.1%	53.8%
Age:					**	**
Under 45	375	55	345	9.9%	14.7%	9.3%
45-64	197	29	275	5.2%	7.7%	7.4%
65-69	615	72	538	16.3%	19.2%	14.5%
70-74	661	62	583	17.5%	16.5%	15.7%
75-79	637	54	707	16.9%	14.4%	19.0%
80-84	664	47	672	17.6%	12.5%	18.1%
85 and over	625	56	602	16.6%	14.9%	16.2%
Race/Ethnicity:					**	**
Hispanic	343	43	348	9.1%	11.5%	9.3%
Non-Hispanic White	2,586	227	2,600	68.5%	60.5%	69.9%
Non-Hispanic Black	300	53	345	7.9%	14.1%	9.3%
All Other	174	14	89	4.6%	3.7%	2.4%
Missing/Unknown	371	38	340	9.8%	10.1%	9.1%
Newly Eligible:						
Not Newly Eligible	3,418	339	3,495	90.6%	90.4%	91.4%
Newly Eligible	356	36	327	9.4%	9.6%	8.6%
Census Division:						**
Northeast	687	84	645	18.2%	22.4%	17.3%
Midwest	772	69	875	20.5%	18.4%	23.5%
South	1,418	140	1,525	37.6%	37.3%	41.0%
West	897	82	677	23.8%	21.9%	18.2%
HHS Census Region:						**
1 CT, MA, ME, NH, RI, VT	140	17	101	3.7%	4.5%	2.7%
2 NJ, NY, PR	543	66	542	14.4%	17.6%	14.6%
3 DC, DE, MD, PA, VA, WV	565	44	613	15.0%	11.7%	16.5%
4 AL, FL, GA, KY, MS, NC, SC, TN	209	26	263	5.5%	6.9%	7.1%
5 IL, IN, MI, MN, OH, WI	757	70	784	20.1%	18.7%	21.1%
6 AR, LA, NM, OK, TX	258	36	301	6.8%	9.6%	8.1%
7 IA, KS, MO, NE	370	35	370	9.8%	9.3%	9.9%
8 CO, MT, ND, SD, UT, WY	310	37	303	8.2%	9.9%	8.1%
9 AZ, CA, HI, NV	590	44	375	15.6%	11.7%	10.1%
10 AK, ID, OR, WA	32	-	70	0.8%	0.0%	1.9%
ACO:						

Frame Characteristic	NR #	HR #	OR #	NR %	HR %	OR %
Not ACO	3,216	314	3,150	85.2%	83.7%	84.6%
ACO	558	61	572	14.8%	16.3%	15.4%

<sup>a</sup> Beneficiaries living in the community only; beneficiaries living in facilities excluded by design.

\* Significant at P<0.05

\*\* Significant at P<0.01

As an additional means of evaluating nonresponse based on frame data, multivariate analyses were used to identify the characteristics of beneficiaries least likely to respond to an interview. Cases were coded as either responding to or not responding to the Fall 2015 interview, and logistic regression modeling was used to identify which case characteristics significantly relate to unit non-response.

For the 2015 panel, frame attributes were used as covariates to build a logistic regression model of Fall 2015 non-respondents. The dependent variable is an indicator identifying whether the beneficiary is a non-respondent. The independent variables include sex, race/ethnicity, age group, a newly eligible flag, Census division, and a hard-to-contact indicator for all beneficiaries (coded as 1 for any beneficiary, respondent or non-respondent, requiring at least nine contact attempts in the field, and 0 otherwise). We used the stepwise option for model selection; only the newly eligible flag was dropped from the model. Since multiple tests are performed, in order to prevent falsely significant results we used the Bonferroni adjustment to adjust p-values for multiplicity and test significant differences.

Exhibit 5 displays the results of the logistic regression analysis. Holding all other covariates at a fixed value, the odds of being a non-respondent is about 14 percent lower for males (0.86 odds ratio) than for females. Beneficiaries of other races<sup>3</sup> are almost twice as likely to be non-respondents as Hispanic beneficiaries. Furthermore, younger beneficiaries (age 45-64) are 31 percent less likely to be non-respondents than beneficiaries aged 85 and over, and beneficiaries who live in the South are 32 percent more likely to be non-respondents than those in the West. Finally, hard-to-contact beneficiaries are about 60 percent more likely to be non-respondents than other beneficiaries.

**Exhibit 5:** Logistic Regression Model of 2015 Panel Non-respondents, Fall 2015

Effect	Estimates	Standard Error	Odds Ratio Estimates	Adjusted P Value
SEX Male vs Female	-0.16	0.05	0.86	0.0009
RACE Non-Hispanic White vs Hispanic	0.14	0.08	1.15	1.0000
RACE Non-Hispanic Black vs Hispanic	-0.12	0.11	0.89	0.5790
RACE Other vs Hispanic	0.68	0.15	1.97	<.0001
AGE Group <45 vs 85+	-0.05	0.10	0.95	1.0000
AGE Group 45-64 vs 85+	-0.38	0.11	0.69	0.0140

<sup>3</sup> Defined as beneficiaries not coded as Hispanic, Non-Hispanic White, or Non-Hispanic Black.



AGE Group 65-69 vs 85+	-0.02	0.09	0.98	1.0000
AGE Group 70-74 vs 85+	0.04	0.08	1.04	1.0000
AGE Group 75-79 vs 85+	-0.14	0.08	0.87	1.0000
AGE Group 80-84 vs 85+	-0.03	0.08	0.97	1.0000
CNSUS Division North East vs West	0.03	0.07	1.03	1.0000
CNSUS Division Mid- West vs West	-0.06	0.06	0.94	1.0000
CNSUS Division South vs West	0.28	0.06	1.32	<.0001
Hard to Contact No vs Yes	-0.89	0.06	0.41	<.0001

## 2.3 Comparison of Respondents to Non-Respondents: Medicare Claims

### Payment Measures

For the next set of analyses, non-respondents, hard-to-contact respondents, and other respondents were compared using 2015 claims data to identify any differences in claims payment amounts among these groups. In order to conduct the composite test for no differences among the three response categories, we used a generalized linear model (GLM), with the claims payment amount as the dependent variable and a three-level response indicator (hard-to-contact respondent, other respondent, or non-respondent) as the independent variable. Contrast statements were used in a one-way ANOVA to test the hypothesis that no differences exist among these groups. Exhibit 6 shows a comparison of 2015 Panel non-respondents, hard-to-contact respondents, and other respondents in Fall 2015 across seven claims payment amount categories. Mean payment amounts for each group are presented in the first three columns, and significant differences for the three contrast comparisons are indicated in the subsequent columns. No significant differences were found among any of the groups.

**Exhibit 6:** 2015 Claims Payment Measures for 2015 Panel<sup>a</sup> Non-Respondents (NR), Hard-to-Contact Respondents (HR), and Other Respondents (OR): Fall 2015

Claims Payment Measure	Mean of NR \$	Mean of HR \$	Mean of OR \$	HR vs. NR	OR vs. NR	HR vs. OR
Claims payment amount: Carrier	1,924.52	2,137.68	2,025.22			
Claims payment amount: Durable medical equipment	132.59	114.51	146.53			
Claims payment amount: Home health agency	320.13	466.56	374.60			
Claims payment amount: Hospice	168.36	12.52	194.42			
Claims payment amount: Inpatient	1,810.45	2,472.34	1,919.52			
Claims payment amount: Outpatient	938.93	1,060.75	1,155.89			
Claims payment amount: Skilled nursing facility	419.83	420.36	374.20			
All claims: Total payment amount	5,714.72	6,684.72	6,190.34			

<sup>a</sup> Beneficiaries living in the community only; beneficiaries living in facilities excluded.

Exhibits 7 and 8 show similar comparisons of 2015 Panel non-respondents, hard-to-contact respondents, and other respondents in Winter and Summer 2015, respectively, across the same claims payment measures. Here, the only significant differences were found in the hospice claims payment amounts in Winter 2016; non-respondents had significantly higher mean hospice claims payments than did the other respondents.

**Exhibit 7:** 2015 Claims Payment Measures for 2015 Panel<sup>a</sup> Non-Respondents (NR), Hard-to-Contact Respondents (HR), and Other Respondents (OR): Winter 2016

Claims Payment Measure	Mean of NR \$	Mean of HR \$	Mean of OR \$	HR vs. NR	OR vs. NR	HR vs. OR
Claims payment amount: Carrier	2,446.03	2,303.30	1,921.67			
Claims payment amount: Durable medical equipment	124.06	163.63	146.78			
Claims payment amount: Home health agency	367.85	392.95	385.87			
Claims payment amount: Hospice	376.53	n/a <sup>b</sup>	143.64	n/a	*	n/a
Claims payment amount: Inpatient	2,680.06	1,719.49	1,821.98			
Claims payment amount: Outpatient	1,242.04	1,139.59	1,125.62			
Claims payment amount: Skilled nursing facility	349.34	479.70	378.28			
All claims: Total payment amount	7,585.88	6,198.67	5,923.80			

<sup>a</sup> Beneficiaries living in the community only; beneficiaries living in facilities excluded.

<sup>b</sup> There are no Hospice payments for hard-to-contact respondents in Winter 2016.

**Exhibit 8:** 2015 Claims Payment Measures for 2015 Panel<sup>a</sup> Non-Respondents (NR), Hard-to-Contact Respondents (HR), and Other Respondents (OR): Summer 2016

Claims Payment Measures	Mean of NR \$	Mean of HR \$	Mean of OR \$	HR vs. NR	OR vs. NR	HR vs. OR
Claims payment amount: Carrier	1,993.99	2,480.53	1,898.89			
Claims payment amount: Durable medical equipment	143.37	186.91	148.27			
Claims payment amount: Home health agency	401.95	263.51	384.30			
Claims payment amount: Hospice	156.49	123.08	124.34			
Claims payment amount: Inpatient	2,382.48	1,917.29	1,537.11			
Claims payment amount: Outpatient	1,041.69	1,146.46	1,166.56			
Claims payment amount: Skilled nursing facility	380.85	626.95	375.77			

All claims: Total payment	6,500.75	5,635.21
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<sup>a</sup> Beneficiaries living in the community only; beneficiaries living in facilities excluded.

**2.4 Comparison of Respondents to Non-Respondents: Chronic Condition Attributes**

Another source of data used in this non-response bias analysis is the Master Beneficiary Summary File in the Chronic Conditions Warehouse (CCW).<sup>4</sup> These data are available on an annual basis for all Medicare beneficiaries and identify whether a beneficiary met the claims and/or coverage criteria to be classified as having a particular chronic condition. These conditions include chronic kidney disease, diabetes, depression, stroke, breast cancer, anemia, asthma, and benign prostatic hyperplasia.

For each of Fall 2015 through Winter 2017, respondents were compared to non-respondents across 2015 year end Chronic Condition attributes. Exhibit 9 displays the percentage of 2015 Panel respondents and non-respondents classified as having each particular chronic condition, based on meeting the claims and/or coverage criteria for each condition. Exhibit 10 displays the same comparison for the 2012-2014 continuing panel respondents and non-respondents. Again, the Rao-Scott chi-square test was used to test the significance of differences between respondents and non-respondents. No significant differences in chronic conditions attributes were found between respondents and non-respondents in either the 2015 or combined 2012-2014 Panels.

**Exhibit 9:** 2015 Panel<sup>a</sup> Respondents (R) vs. Non-Respondents (N), by Round, Across Chronic Condition Attributes

Chronic Condition	Fall 2015		Winter 2016		Summer 2016		Fall 2016		Winter 2017	
	N	R	N	R	N	R	N	R	N	R
Chronic Kidney Disease	58.1	58.2	59.7	57.9	60.3	58.0	56.7	57.7	55.9	57.9
Diabetes	59.7	59.9	61.6	59.5	61.5	59.7	60.7	58.8	57.6	59.0
Depression	60.9	60.8	62.3	60.5	61.9	60.7	60.3	60.3	60.1	60.3
Stroke/Transient Ischemic Attack	59.9	59.8	61.1	59.6	60.9	59.7	59.4	59.3	58.0	59.4
Breast Cancer	59.7	59.7	61.2	59.4	60.7	59.5	59.3	59.2	57.6	59.3
Anemia	61.2	61.1	62.7	60.7	62.9	60.7	60.7	60.3	59.2	60.4
Asthma	60.2	60.0	61.5	59.7	61.1	59.8	59.3	59.6	58.0	59.7
Benign Prostatic Hyperplasia	59.9	59.9	61.4	59.6	60.9	59.7	59.4	59.3	57.6	59.5

<sup>a</sup> Beneficiaries living in the community only; beneficiaries living in facilities excluded by design.

**Exhibit 10:** 2012-2014 Panel<sup>a</sup> Respondents (R) vs. Non-Respondents (N), by Round, Across Chronic Condition Attributes

Measurement of Interest	Fall 2015		Winter 2016		Summer 2016		Fall 2016		Winter 2017	
	N	R	N	R	N	R	N	R	N	R

<sup>4</sup> Centers for Medicare & Medicaid Services (CMS). Distributed by Chronic Conditions Data Warehouse (CCW), 2018. See <https://www.ccwdata.org>.

Chronic Kidney Disease	62.3	63.2	59.7	57.9	64.3	63.7	63.0	62.9	65.0	62.8
Diabetes	63.5	64.6	61.6	59.5	66.3	64.6	64.3	64.1	65.7	63.9
Depression	63.5	64.3	62.3	60.5	65.1	64.8	64.5	63.8	65.7	63.6
Stroke/Transient Ischemic Attack	62.7	63.4	61.1	59.6	64.6	64.0	63.2	63.1	65.0	63.0
Breast Cancer	62.6	63.3	61.2	59.4	64.7	63.8	63.1	63.0	65.0	62.8
Anemia	63.4	64.7	62.7	60.7	65.3	65.3	64.4	64.7	67.7	64.4
Asthma	62.8	63.7	61.5	59.7	65.0	64.3	63.5	63.3	65.3	63.2
Benign Prostatic Hyperplasia	63.0	63.5	61.4	59.6	64.7	64.0	63.1	63.3	65.0	63.2

<sup>a</sup> Beneficiaries living in the community only; beneficiaries living in facilities excluded by design.

## 2.5 Comparison of Respondents to Non-Respondents: Self-Reported Health Characteristics

For the final set of analyses, respondents to the MCBS in Fall 2015 were analyzed and followed from Winter 2016 to Winter 2017. Because all of the Fall 2015 respondents provided self-reported health data in the Fall questionnaire, these data could be used to construct a variety of health characteristics for assessing differences between subsequent round respondents and non-respondents within this population. Exhibit 11 summarizes the constructs used for comparison. They include, among others, measures indicating difficulties in accessing and managing health care, admission to a hospital overnight, level of confidence in the medical provider, and mobility and daily living obstacles. For each of the self-reported measurements of interest, the Rao-Scott chi-square test was used to identify statistically significant differences between respondents and non-respondents.

**Exhibit 11:** Measurements of Interest: Self-Reported Health Characteristics from the 2015 Survey File

Health Characteristic	Description	Values
Difficulty accessing health care	Indicates whether beneficiary had difficulty getting desired/required health care	1: Had difficulty 0: No difficulty
Admitted to hospital overnight	Beneficiary admitted to hospital overnight	1: Admitted 0: Not Admitted
Confidence in doctor	Indicates level of agreement to statement “[Beneficiary] has great confidence in [medical provider]”	1: Strongly agree 2: Agree 3: Strongly disagree 4: Disagree 5: Not applicable
Ease of managing medical care	Beneficiary’s rating of their ease of managing medical care	0: Hard to manage to 10: Easy to manage
Home service needs	Indicates whether beneficiary needed home service to help with health	1: Yes 0: No

Health Characteristic	Description	Values
Medical care location	Indicates type of location beneficiary usually goes for medical care	1: Doctor's office or group practice 2: Medical clinic 3: Managed care plan center/HMO 4: Neighborhood/Family health center 5: Hospital outpatient department/clinic 6: VA Facility 7: All other
Mobility difficulties	Indicates whether beneficiary has trouble getting places	1: Had difficulty 0: No difficulty
Instrumental Activities of Daily Living (IADL) functions	Indicates whether beneficiary had difficulty with at least one of the following: managing money, doing heavy housework, doing light housework, making meals, shopping, or using the phone	1: Had difficulty 0: No difficulty
Activities of Daily Living (ADL) functions	Indicates whether beneficiary had difficulty with at least one of the following: bathing/showing, getting in/out of chairs, dressing, eating, using the toilet, or walking	1: Had difficulty 0: No difficulty
Dwelling	Description of beneficiary's home	1: One-family, detached 2: Two-family or duplex 3: Apartment or condo building 4: Mobile home, trailer 5: Rowhouse, townhouse 6: All other

Comparisons of both 2015 Panel and combined 2012-2014 Panel respondents to non-respondents in Winter 2016 through Winter 2017 were conducted across these self-reported health measures. Exhibit 12 displays the distributions of 2015 Incoming Panel respondents and non-respondents, by round, across the various measures, and Exhibit 13 displays the measures and rounds in which significant differences were found between respondents and non-respondents. Although there are some exceptions, generally, non-respondents are more likely to have mobility difficulties and difficulties with Instrumental Activities of Daily Living (IADL) functions and Activities of Daily Living (ADL) functions. Non-respondents also appear to be more likely to obtain medical care at a VA facility than respondents.

**Exhibit 12:** 2015 Panel<sup>a</sup> Respondents (R) vs. Non-Respondents (NR), by Round, Across Self-Reported Health Characteristics

Health Characteristic	Value in %	Winter 2016		Summer 2016		Fall 2016		Winter 2017	
		NR	R	NR	R	NR	R	NR	R
Difficulty accessing health care	% with difficulties	9.7	8.2	11.2	7.4	9.5	7.2	6.3	7.4
Admitted to hospital overnight	% Admitted	16.8	14.4	16.0	14.3	13.8	14.2	15.8	14.0
Confidence in Doctor	1: Strongly agree	50.8	51.6	51.5	51.6	52.2	51.5	47.4	52.0
	2: Agree	44.2	43.0	43.4	43.1	41.8	43.2	44.2	43.1
	3: Strongly disagree	3.6	4.1	4.1	4.2	4.8	4.0	4.7	3.9
	4: Disagree	0.5	0.7	0.5	0.5	0.6	0.8	1.4	0.7
	5: Not applicable	0.9	0.6	0.5	0.6	0.6	0.6	2.3	0.4
Ease of managing medical care	0-4: Hard to manage	5.1	4.2	4.8	4.1	5.3	3.8	7.5	3.4
	5-7	14.4	14.1	15.1	13.5	14.3	13.9	18.6	13.3
	8-9	31.9	30.4	32.7	30.1	31.4	29.7	24.1	30.3
	10: Easy to manage	48.6	51.3	47.5	52.3	48.9	52.6	49.7	52.9
Home service needs	Yes	14.3	12.5	14.8	12.6	13.0	11.9	15.9	11.4
Medical care location	1: Doctor's office or group practice	78.3	73.4	73.5	73.1	74.5	73.1	74.4	73.0
	2: Medical clinic	12.8	14.8	15.4	15.2	12.9	15.2	13.7	15.4
	3: Managed care plan center/HMO	1.8	4.0	3.6	4.2	3.6	4.1	5.9	3.9
	4: Neighborhood/Family health center	0.1	0.5	0.5	0.6	0.4	0.5	0.9	0.4
	5: Hospital outpatient department/clinic	1.0	1.9	1.6	1.9	1.7	2.1	1.4	2.1
	6: VA Facility	3.3	2.9	4.1	2.4	3.2	2.6	2.7	2.6
	7: All other	2.7	2.5	1.4	2.6	3.8	2.4	0.9	2.6
Mobility difficulties	% beneficiaries with difficulties	21.0	20.3	25.4	19.0	23.4	18.4	25.9	17.5
IADL functions	% SP with difficulties	39.4	40.8	44.3	39.9	44.7	39.0	46.0	38.2
ADL functions	% SP with difficulties	38.7	39.5	45.1	38.4	45.2	36.8	41.0	36.3
Dwelling	1: One-family, detached	68.3	69.8	69.9	69.7	69.1	70.0	72.0	69.8
	2: Two-family or duplex	2.9	3.6	5.1	3.5	4.0	3.2	3.8	3.2
	3: Apartment or condo building	17.5	15.5	15.9	15.6	15.4	15.4	14.2	15.6
	4: Mobile home, trailer	6.8	7.6	6.3	7.7	8.1	7.8	5.4	8.0
	5: Rowhouse, townhouse	3.7	2.4	2.2	2.5	2.9	2.4	2.1	2.4
	6: All other	0.8	1.0	0.6	1.0	0.5	1.2	2.5	1.0

Health Characteristic	Value in %	Winter 2016		Summer 2016		Fall 2016		Winter 2017	
		NR	R	NR	R	NR	R	NR	R

<sup>a</sup> Beneficiaries living in the community only; beneficiaries living in facilities excluded by design.

Source: 2015 Survey File.

**Exhibit 13:** Significance of Differences for 2015 Panel<sup>a</sup> Respondents vs. Non-Respondents, by Round, Across Self-Reported Health Characteristics

Health Characteristic	Winter 2016	Summer 2016	Fall 2016	Winter 2017
Difficulty accessing health care		**		
Admitted to hospital overnight				
Confidence in doctor				
Ease of managing medical care				**
Home service needs				*
Medical care location	**	**		
Mobility difficulties		**	**	**
IADL functions		*	**	**
ADL functions		**	**	
Dwelling				

<sup>a</sup> Beneficiaries living in the community only; beneficiaries living in facilities excluded by design

\* Significant at P<0.05

\*\* Significant at P<0.01

Exhibit 14 displays the comparison of continuing (2012 to 2014 Panel) respondents to non-respondents, by round, across the same self-reported health characteristics, and Exhibit 15 shows the corresponding significant differences that were found between respondents and non-respondents. Similar to the 2015 Panel results, non-respondents in the continuing panels are generally more likely to have mobility difficulties, difficulties obtaining health care, and difficulties in IADL and ADL functions.

**Exhibit 14:** Continuing Panel<sup>a</sup> Respondents (R) vs. Non-Respondents (NR), by Round, Across Self-Reported Health Characteristics

Health Characteristic	Value in %	Winter 2016		Summer 2016		Fall 2016		Winter 2017	
		NR	R	NR	R	NR	R	NR	R
Difficulty accessing health care	% SP with difficulties	7.2	5.4	7.7	4.9	5.2	5.1	7.3	4.9
Admitted to hospital overnight	% Admitted	5.9	11.8	13.5	11.5	12.6	11.0	13.3	10.8
Confidence in doctor	1: Strongly agree	47.4	47.0	45.1	47.9	47.1	47.4	49.4	47.3
	2: Agree	46.3	47.7	47.2	47.3	48.5	47.3	46.2	47.4
	3: Strongly disagree	4.5	3.7	6.1	3.4	3.3	3.5	2.4	3.6
	4: Disagree	0.7	0.7	0.5	0.7	0.6	0.8	1.6	0.7

Health Characteristic	Value in %	Winter 2016		Summer 2016		Fall 2016		Winter 2017	
		NR	R	NR	R	NR	R	NR	R
	5: Not applicable	1.1	0.8	1.1	0.7	0.5	0.9	0.4	1.0
Ease of managing medical care	0-4: Hard to manage	5.2	3.8	6.5	3.6	3.9	3.2	3.7	3.2
	5-7	16.0	12.9	12.8	12.5	12.7	13.1	17.6	12.7
	8-9	33.2	33.0	33.3	32.9	33.9	32.4	29.2	32.7
	10: Easy to manage	45.6	50.3	47.5	51.0	49.4	51.3	49.5	51.4
Home service needs	Yes	14.3	10.3	13.3	9.4	10.3	9.6	14.7	9.3
Medical care location	1: Doctor's office or group practice	79.3	75.4	76.6	74.2	74.7	75.6	78.1	75.4
	2: Medical clinic	11.8	14.7	13.7	15.3	14.6	15.0	11.3	15.2
	3: Managed care plan center/HMO	2.6	2.7	2.5	3.1	3.0	2.6	2.3	2.6
	4: Neighborhood/Family health center	0.1	0.3	0.1	0.4	0.3	0.4	0.4	0.4
	5: Hospital outpatient department/clinic	1.6	1.9	1.8	2.1	2.1	1.8	1.6	1.8
	6: VA Facility	1.9	2.5	1.8	2.5	2.7	2.5	3.9	2.4
	7: All other	2.7	2.5	3.4	2.5	2.7	2.2	2.3	2.2
Mobility difficulties	% SP with difficulties	20.9	14.6	18.5	13.1	14.5	13.8	19.9	13.3
IADL functions	% SP with difficulties	42.0	36.8	39.2	35.9	36.5	36.6	39.6	36.3
ADL functions	% SP with difficulties	40.3	35.1	37.1	33.8	34.5	35.0	42.5	34.5
Dwelling	1: One-family, detached	67.4	69.9	70.7	69.9	70.9	69.8	67.1	70.0
	2: Two-family or duplex	4.1	3.6	2.6	3.7	3.8	3.7	4.2	3.6
	3: Apartment or condo building	17.3	15.9	17.4	15.7	14.7	15.6	17.5	15.4
	4: Mobile home, trailer	7.6	7.5	6.4	7.4	7.4	7.9	8.4	7.8
	5: Rowhouse, townhouse	2.3	2.1	2.1	2.2	1.9	2.2	1.7	2.3
	6: All other	1.4	1.0	0.8	1.1	1.3	0.9	1.0	0.9

<sup>a</sup> Beneficiaries living in the community only; beneficiaries living in facilities excluded by design.

Source: 2015 Survey File.

**Exhibit 15:** Significance of Differences for Continuing Panel<sup>a</sup> Respondents vs. Non-Respondents, by Round, Across Self-Reported Health Characteristics

Health Characteristic	Winter 2016	Summer 2016	Fall 2016	Winter 2017
Difficulty accessing health care		**		
Admitted to hospital overnight	**		*	
Confidence in doctor		*		



Health Characteristic	Winter 2016	Summer 2016	Fall 2016	Winter 2017
Ease of managing medical care		*		
Home service needs	*	*		*
Medical care location				
Mobility difficulties	**	**		*
IADL functions	**			
ADL functions	*			*
Dwelling				

<sup>a</sup> Beneficiaries living in the community only; beneficiaries living in facilities excluded by design.

\* Significant at P<0.05

\*\* Significant at P<0.01

Finally, non-respondents were compared to hard-to-contact and other respondents across the same set of self-reported health characteristics. Exhibit 16 shows the distributions of 2015 Panel non-respondents, hard-to-contact respondents, and other respondents across the various measures in Winter and Summer 2016, and Exhibit 17 displays the measures and rounds in which significant differences were found between non-respondents and hard-to-contact or other respondents. Non-respondents in the Winter 2016 round are more likely to receive medical care in a doctor's office or group practice, and less likely to receive care in a managed care plan center or a neighborhood health center, than the other two groups. However, those differences do not carry over into the Summer 2016 round; in that round, non-respondents are more likely than other respondents to receive their care in a VA facility, but non-respondents and hard-to-contact respondents are not significantly different. (The large sample sizes among other and non-respondents may contribute to the significant findings; while the actual percentages are not practically very different, the differences are statistically significant.)

Significant differences were also found between non-respondents and respondents with respect to mobility, IADL, and ADL functions. In the Winter 2016 round, non-respondents were significantly less likely than hard-to-contact respondents to have mobility difficulties, IADL function difficulties, and ADL function difficulties. In the Summer 2016 round, non-respondents were more likely than other respondents to have the same difficulties, but less likely than hard-to-contact respondents to have IADL function difficulties. Again, sample sizes impact the interpretation of results here. While the differences between non-respondents and hard-to-contact respondents in the Summer 2016 round look more pronounced than the differences between non-respondents and other respondents, the small sample sizes among the hard-to-contact group result in fewer significant findings even when practical differences appear to be large, and the large sample sizes among non-respondents and other respondents could result in significant findings when the practical differences are small.

**Exhibit 16:** 2015 Panel<sup>a</sup> Non-Respondents (NR) vs. Hard to Contact (HR) Respondents and Other Respondents (OR), by Round, Across Self-Reported Health Characteristics

Health Characteristic	Value in %	Winter 2016			Summer 2016		
		NR	HR	OR	NR	HR	OR
Difficulty accessing health care	% SP with difficulties	9.7	8.4	8.2	9.9	11.1	7.3

Health Characteristic	Value in %	Winter 2016			Summer 2016		
		NR	HR	OR	NR	HR	OR
Admitted to hospital overnight	% Admitted	16.8	17.3	14.2	14.5	21.8	14.0
Confidence in doctor	1: Strongly agree	50.8	49.0	51.8	51.7	58.2	51.3
	2: Agree	44.2	40.7	43.1	42.8	33.0	43.5
	3: Strongly disagree	3.6	7.2	3.9	4.0	8.8	4.0
	4: Disagree	0.5	1.5	0.6	1.1	-	0.5
	5: Not applicable	0.9	1.5	0.5	0.5	-	0.6
Ease of managing medical Care	0-4: Hard to manage	5.1	4.4	4.2	4.3	9.3	3.9
	5-7	14.4	21.1	13.6	15.6	12.8	13.5
	8-9	31.9	31.7	30.3	31.2	33.7	29.9
	10: Easy to manage	48.6	42.8	51.8	48.9	44.2	52.7
Home service needs	Yes	14.3	15.0	12.3	12.2	13.8	12.6
Medical care location	1: Doctor's office or group practice	78.3	70.9	73.6	74.0	73.4	73.1
	2: Medical clinic	12.8	17.9	14.6	14.2	12.8	15.3
	3: Managed care plan center/HMO	1.8	5.1	3.9	3.3	4.3	4.2
	4: Neighborhood/ Family health center	0.1	1.0	0.4	0.2	-	0.6
	5: Hospital outpatient department/clinic	1.0	1.0	2.0	2.0	1.1	2.0
	6: VA Facility	3.3	2.0	3.0	4.2	2.1	2.4
	7: All other	2.7	2.0	2.5	2.2	6.4	2.4
Mobility difficulties	% SP with difficulties	21.0	27.4	19.8	23.0	27.3	18.7
IADL functions	% SP with difficulties	39.4	52.6	40.0	42.8	52.5	39.3
ADL functions	% SP with difficulties	38.7	44.2	39.2	41.9	48.5	37.9
Dwelling	1: One-family, detached	65.9	65.6	65.6	70.2	57.1	70.3
	2: Two-family or duplex	3.1	4.2	4.2	4.0	3.1	3.5
	3: Apartment or condo building	18.8	17.2	17.2	15.3	20.4	15.4
	4: Mobile home, trailer	7.3	9.3	9.3	7.3	12.2	7.5
	5: Rowhouse, townhouse	4.0	2.3	2.3	2.4	5.1	2.4
	6: All other	0.9	1.4	1.4	0.9	2.0	1.0

<sup>a</sup> Beneficiaries living in the community only; beneficiaries living in facilities excluded by design.

Source: 2015 Survey File

**Exhibit 17:** Significance of Differences for 2015 Panel<sup>a</sup> Non-Respondents (NR) vs. Hard to Contact (HR) Respondents and Other Respondents (OR), by Round, Across Self-Reported Health Characteristics

Health Characteristic	Winter 2016		Summer 2016	
	NR vs. HR	NR vs. OR	NR vs. HR	NR vs. OR
Difficulty accessing health care				*
Admitted to hospital overnight			*	
Confidence in doctor				
Ease of managing medical care				
Home service needs				
Medical care location	*	**		**
Mobility difficulties	*			**
IADL functions	**		*	*
ADLS functions	*			**
Dwelling				

<sup>a</sup> Beneficiaries living in the community only; beneficiaries living in facilities excluded by design.

\* Significant at P<0.05

\*\* Significant at P<0.01

### 3. Summary and Implications

Attrition rates in the MCBS follow patterns typical of longitudinal studies, with the highest attrition occurring at the first time in sample and attrition rates decreasing over subsequent rounds. The attrition rate for the 2015 Panel was just under 50 percent in Fall 2015 and decreased to approximately 10 percent by Winter 2017.

Fall 2015 respondents and non-respondents were compared on various measures, including frame characteristics, Medicare claims payments, and chronic conditions, in order to identify areas of potential bias. The only statistically significant differences were found among frame characteristics. For the 2015 Incoming Panel, non-respondents appear more likely to be female and older, and slightly less likely to be non-Hispanic black. Among the continuing panels, however, non-respondents tend to skew younger. However, the weighting procedure includes a raking step that accounts for all of the frame characteristics for which differences were found (raking to control totals is performed using several frame variables, including age group, sex, race and census region, among others; an additional non-response bias adjustment is also made). Thus, the small potential bias identified via these analyses is expected to be minimized by the weighting procedures.

Respondents to the MCBS in Fall 2015 were also analyzed further. Potential bias was examined by comparing non-respondents to respondents in subsequent rounds based on their self-reported health data in the Fall 2015 questionnaire. Some differences were found between non-respondents and respondents across these characteristics, particularly for those related to mobility. Special attention will be paid to these groups in the field.

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