Associations of Mail Survey Length and Layout with Response Rates

Q Burkhart, MS

RAND Corporation

1776 Main Street

Santa Monica, CA 90401

Phone: (310) 393-0411, x6281

Email: qburkhar@rand.org

Nate Orr, MA

RAND Corporation

1776 Main Street

Santa Monica, CA 90401

Phone: (310) 393-0411, x6712

Email: orr@rand.org

Julie A. Brown, BA

RAND Corporation

1776 Main Street

Santa Monica, CA 90401

Phone: (310) 393-0411, x6212

Email: julieb@rand.org

Ron D. Hays, PhD

University of California, Los Angeles

Division of General Internal Medicine & Health Services Research

1100 Glendon Avenue, Suite 850 (Room 872)

Los Angeles, CA 90024

Phone: (310) 794-2294

Email: drhays@ucla.edu

and

RAND Corporation

1776 Main Street

Santa Monica, CA 90401

Email: hays@rand.org

Paul D. Cleary, PhD

Yale School of Public Health

60 College Street

New Haven, CT 06511

Phone: (203) 785-3434

Email: paul.cleary@yale.edu

Megan K. Beckett, PhD

RAND Corporation

1776 Main Street

Santa Monica, CA 90401

Phone: (310) 393-0411, x6762

Email: beckett@rand.org

Suzanne E. Perry, PhD

RAND Corporation

1776 Main Street

Santa Monica, CA 90401

Phone: (310) 393-0411, x7473

Email: sperry@rand.org

Sarah Gaillot, PhD

Centers for Medicare & Medicaid Services

7500 Security Boulevard

Baltimore, MD 21244

Phone: (410) 786-4637

Email: Sarah.Gaillot@cms.hhs.gov

Marc N. Elliott, PhD *(corresponding author)*

RAND Corporation

1776 Main Street

Santa Monica, CA 90401

Phone: (310) 393-0411, x7931

Email: Elliott@rand.org

Page Count: 24

Running Head: Associations of Mail Survey Length and Layout with Response Rates

Submission Process: MCRR

Word Count: 3465

Number of Pages: 24

Number of References: 31

Number of Figures: 0

Number of Tables: 4

Abstract

We assess the association between survey layout and response rates (RRs) in the 2017 Medicare Advantage (MA) CAHPS mail survey. Among 438 MA plans surveyed by 6 vendors, there was latitude in survey layout, and plans could add up to 12 supplemental items. Regression models predicted survey response from survey characteristics (page count, number of supplemental items, and survey attractiveness), and beneficiary sociodemographics. Beneficiary-age-by-survey-characteristic interactions assessed whether survey characteristics were more strongly related to RRs among older beneficiaries. We found that surveys with more supplemental items and less attractive layouts had lower adjusted odds of response. RRs were more sensitive to format among older beneficiaries. The difference in adjusted RRs for the most favorable versus the least favorable survey design was 14.5%. For a 65-year-old, this difference was 13.6%; for an 80-year-old, it was 21.0%. These findings suggest that even within a relatively standardized survey, formatting can substantially influence RRs.

INTRODUCTION

Patient surveys, such as the Consumer Assessment of Healthcare Providers and Systems (CAHPS) surveys and the English General Practice Patient Survey (Roland et al., 2009), are increasingly used to measure patient care experiences . Low response rates can jeopardize a survey's use for incentive payment programs. For example, hospitals are required to achieve 100 Hospital CAHPS (HCAHPS) completed surveys annually to be eligible for value-based purchasing incentives that represented up to 2% of Medicare payments in 2018 (Centers for Medicare & Medicaid Services, 2018). Similarly, Medicare CAHPS surveys require minimum reliability thresholds for public reporting and use in pay-for-performance (Health Services Advisory Group, 2018b).

There have been concerns that declines in response rates may increase data-collection costs, reduce the reliability of performance measurement (Morath, 2017), and compromise the representativeness of the sample (Beebe, Davern, McAlpine, Call, & Rockwood, 2005; Fowler et al., 2002; Klein et al., 2011). The evidence on the effect of low response rates on nonresponse bias is mixed (Groves & Peytcheva, 2009), but there is interest in identifying ways of improving response rates in patient surveys (Saunders, Elliott, Lyratzopoulos, & Abel, 2016) and population surveys more generally. While some have called for more use of new survey modes such as web surveys or mobile phones, there are significant concerns about using these

approaches due to the lack of appropriate contact information, such as email addresses, or legal issues, such as the Telephone Consumer Protection Act requirement that a live interviewer be available to interact with potential respondents. Typically, newer survey modes are achieving lower response rates and poorer representativeness than traditional mail, telephone, or mail with telephone follow-up (Elliott et al., 2013; Shih & Xitao, 2008). Further compounding issues of representativeness, there is differential access to and use of the Internet, especially for older populations. For example, the young-old, along with higher income and more educated older adults, are more likely to access and use the Internet than their older and lower socioeconomic-status counterparts (Hunsaker & Hargittai, 2018).

Another approach to improving response rates is to identify best practices for existing survey modes, even in the case of Medicare Advantage (MA) CAHPS surveys, where many aspects of the survey design are specified by Quality Assurance guidelines (Health Services Advisory Group, 2018b). Medicare beneficiaries (hereafter "beneficiaries") may receive fee-for-service coverage or enroll in MA managed care plans. MA plans hire individual survey vendors to administer the MA CAHPS survey to their members and together, they select options that can affect response rates. For example, MA plans can add up to 12 supplemental items to MA CAHPS surveys; there is evidence that more supplemental items reduces response rates (Beckett et al., 2016). Other factors, such as spacing and visual consistency, may affect

comprehension and the effort required of respondents to answer survey questions. Such factors may be especially important for older beneficiaries. In this study, we evaluate only aspects of survey design that might influence survey and item response rates for MA CAHPS mail surveys. MA CAHPS is administered by mail with telephone follow-up of mail nonrespondents, with mail accounting for most completed surveys (Beckett et al., 2016). While variation in implementation of the standardized telephone follow-up survey protocols, such as variation in interviewer expertise, is also likely to influence response rates, we focus on aspects of the mail survey as predictors because (a) it is easier to measure and objectively quantify aspects of mail layout than aspects of telephone follow-up and (b) a higher proportion of MA CAHPS surveys are returned by mail than completed by telephone. While one might use response rates from only the mail phase as the outcome measure, we instead predicted total (mail and telephone follow-up) response rate to protect against a spurious finding in the event that that mail layouts associated with higher mail response rates does not increase the total response rate of the full mixed mode protocol (e.g. if appealing mail layout merely causes those who would have responded in telephone follow-up to respond sooner).

We focused on aspects of mail survey design that are key to making surveys easy to follow, and we exploited their natural variation by survey vendor and MA plan. We asked three research questions: (1) To what extent is the layout and length of mail survey booklets related to overall response rates to

a mail survey with telephone follow-up? (2) Is the association stronger for older adults? (3) How much could response rates be improved or worsened by manipulating survey booklet characteristics?

NEW CONTRIBUTION

Multiple systematic reviews have been published looking at the relationship between mail survey design and response propensity in controlled experiments or randomized trials (de Rada, 2005; Edwards et al., 2002; Fox, Crask, & Kim, 1988; Kanuk & Berenson, 1975). The findings from these reviews support many of the standard practices associated with high quality mail survey administration such as personalization of cover letters, multiple follow-up attempts, user friendly or attractive appearance, and legible font-size. However, they give limited insight into which combination of attributes associated with mail survey appearance will have the most positive effect on response rate and no information on whether the effect of specific mail survey attributes may vary depending on the characteristics of the survey respondent. This study addresses these information gaps by systematically examining the association of specific aspects of mail survey appearance with response propensity. Furthermore, this study has sufficient sample size and statistical power to test whether such associations vary by respondent characteristics such as age.

METHODS

Survey and Procedures

The 2017 MA CAHPS survey was based on the CAHPS Health Plan Survey 5.0

and asked about care experiences, with additional questions about Medicare

drug plans (Agency for Healthcare Research and Quality, 2018; Health

Services Advisory Group, 2018a; Schnaier et al., 1999). Sampled

beneficiaries were mailed a pre-notification letter from the Centers for

Medicare & Medicaid Services (CMS) that explained the survey's purpose,

that participation was voluntary and would not affect their benefits, and that

responses would be confidential. If requested, Spanish-language or Chinese-

language surveys were mailed. Nonrespondents received a second

questionnaire. Those who again did not respond to the mailed survey were

called to complete the questionnaire by telephone. The study was approved

by the RAND Corporation's human subject protection committee.

There are two versions of the MA CAHPS survey. The MA-PD survey includes

items regarding prescription drug coverage and beneficiaries whose health

plans include prescription drug coverage receive the MA-PD survey. MA-Only

beneficiaries receive the MA-Only survey. Plans that offer benefit packages

with and without prescription drug coverage administer both versions of the

MA CAHPS survey.

Until 2011, a single survey vendor created the mail survey booklets for all

eligible MA plans, and the surveys were identical across plans. From 2011 to

the present, each MA plan has chosen a vendor from an approved list. Each

vendor creates its own mail survey booklets, which include the core set of

required CAHPS items. Each plan may also add up to 12 supplemental items

to include in its surveys (Health Services Advisory Group, 2018b). Therefore, survey length and layout vary across plans and vendors.

Data

We restricted the analysis to MA plans ("contracts" in CMS' terminology) serving beneficiaries in the 50 US States and Washington, DC. Like Medicare more generally, MA serves both beneficiaries who are eligible through age (65 and older) and younger beneficiaries (age 18-64, 19% of our sample) who are eligible through disability or other entitlements; therefore, beneficiaries age 18 and older were included in the analysis. More information about the demographics of the MA population can be found elsewhere (America's Health Insurance Plans Center for Policy and Research, 2015). There were six vendors and 438 plans in 2017. Table 1 presents the number and percent of MA plans surveyed by each vendor. Among the 438 plans, 306 administered only the MA-PD survey, 11 administered only the MA-Only survey, and 121 administered both. A total of 488,888 beneficiaries were invited to complete the survey, and 206,738 did so (overall response rate 42%).

Survey Characteristics

The following variables were assessed for each plan's survey(s): placement of instructions to the beneficiary for completing the survey, whether additional market names for the health plan were displayed on the survey, page count, layout attractiveness, number of supplemental items (up to 12),[1] and three indicators of types of supplemental items (items developed by the

---

[1] Up to 19 supplemental items were allowed for Medicare-Medicaid Plans (MMPs).

CAHPS consortium, non-CAHPS items, and open-ended free-response items).

See Appendix A for more detail. The "attractiveness" variable is a summary

assessment of the extent to which the mail survey booklet was respondent

friendly, based on the principles established by Dillman as influencing

response rates and data quality: use of color, presence of visual cues to

distinguish survey questions from response options, presence and use of

white space to help the respondent distinguish questions, and clear

navigation cues (Don A. Dillman, Sinclair, & Clark, 1993; Don A. Dillman,

Smyth, & Christian, 2014). We initially assessed and coded each design

element, creating separate variables for color, use of white space, etc.

Review by the larger team led us to create a single variable to represent the

overall survey booklet design. Attractiveness was coded on an ordinal scale

from 1 (least attractive layout) to 4 (most attractive). See Appendix B for a

detailed description of the development of the attractiveness variable.

Survey characteristics were coded by an author familiar with the project and

source material. The coding of survey booklet attractiveness, count of

supplemental items, and type of supplemental items was validated by a

second reviewer for a random sample of 80% of surveys. Placement of

instructions, whether additional plan names were included on the survey,

and page count were validated by a second reviewer for a sample of 30% of

surveys. Validation rates were chosen based on the expected level of rater

disagreement. Validation consisted of coding by two reviewers and resolution

of coding differences.

Beneficiary Characteristics

In addition to the characteristics of the surveys used for the 438 MA plans, we used beneficiary-level administrative data, which included sociodemographic characteristics from survey respondents and nonrespondents: age (categories 18-34, 35-44, 45-54, 55-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90+ years); race/ethnicity (Hispanic, non-Hispanic White, non-Hispanic Black, Asian, other); gender; a low-income indicator (enrolled in both Medicaid and Medicare or receive Low Income Supplement); and rurality (Beale code, where 1=most urban and 5=most rural, with values of 5 or greater coded as 5).

Analysis

To better understand the data, we first calculated descriptive statistics for survey characteristics across and within vendors to assess whether survey characteristics were highly correlated with vendor selection. We then assessed the independent associations between survey characteristics and response propensity by estimating mixed-effects logistic regression models that predicted 2017 beneficiary-level survey response from plan-level survey characteristics. All models also included plan random effects and fixed effects for survey type (an MA-Only indicator), all beneficiary characteristics listed above, and vendor. The plan random effect accounts for clustering of survey characteristics by plan; survey type indicators allow different response rates for the different survey types Because plan response rates are highly correlated over time, we also included the plan's 2010 response

rate as a predictor of 2017 survey response. We used 2010 response rate because 2010 was the last year in which all surveys were fielded by a single vendor with no differences in survey characteristics across health plans. Thus, 2010 response rates capture residual response tendencies that are stable over time. For plans in our 2017 data that did not exist in 2010, we imputed the mean 2010 plan-level response rate and added an indicator of missing 2010 response rate to the model.

To determine whether the adjusted association between survey characteristics and response propensity varied by age, an additional survey response model added as a predictor the interaction of beneficiary age group with survey characteristics likely to be associated with burden on the respondent: survey page length, number of supplemental items, and attractiveness. Though age was coded categorically to allow for nonlinear main effects of age, interactions between age and survey characteristics were parameterized linearly for greater statistical power to detect an approximately linear interaction.

To illustrate the association of survey characteristics with plan-level response rates and estimate how much response rates could be improved or worsened by survey length and layout (i.e. the survey characteristics likely to be associated with respondent burden and interacted with age in the model described in the previous paragraph), we used covariate-adjusted proportions to estimate the response rate for (1) a plan with the highest respondent burden (least attractive survey or 1 on the four-point scale,

longest observed page length among least attractive surveys, and maximum

number of 12 supplemental items); (2) a plan with the lowest respondent

burden (most attractive survey, shortest observed page length among most

attractive surveys, no supplemental items); and (3) the average plan

(average values for attractiveness, page length, and number and type of

supplemental items (Graubard & Korn, 1999)).

RESULTS

Survey Characteristics by Vendor

First, we examined variation of the survey characteristics by vendor

(Appendix C).

Eight MA-only plans working with Vendor 1 placed survey instructions at the

top of the first page; all other MA-PD and MA-only plans put survey

instructions on a separate page. Survey attractiveness ratings were highly

correlated with survey vendor. Vendor 5 was the only vendor with two

different scores on survey attractiveness (3 and 1); all other vendors

received the same survey attractiveness rating for each of the plans they

served. These ratings ranged from 2 to 4 (please see Appendix B for a

written description of what attractiveness ratings include). Half of the

vendors used open-ended supplemental survey items with some of the plans

they worked with; the same was true for listing additional market names for

some plans on the back of the survey. For both survey types, average page

length was 7-8 pages for all vendors except Vendor 1 (average length of 11.7

pages for MA-PD and 10.6 pages for MA-only; see Table 1).

We observed some variation by vendor in the number of supplemental items administered (Table 1), from zero (Vendor 6) to a mean number of 10 supplemental items added for plans working with Vendor 1.

Models Predicting 2017 Survey Response from Plan-Level Survey Characteristics

Across the 438 plans, the median number of sampled beneficiaries was 955; the median response rate was 43%. Beneficiary-level descriptive statistics are presented in Appendix D. Results from the main effects model predicting survey response from survey characteristics are shown in Table 2 (complete results shown in Appendix E). Controlling for beneficiary characteristics, vendor, and the plan's 2010 response rate, greater survey attractiveness was significantly associated with higher odds of response (OR=1.32 for a 1-point increase, OR=2.32 for an increase from minimum attractiveness to maximum attractiveness). Several other survey characteristics were significantly associated with lower response rates. Placement of instructions at the top of the first page of the survey (as opposed to a separate page) was associated with lower odds of response (OR=0.67), as was longer survey length (OR=0.91 for a 1-page increase). Adjusted odds of response decreased with each additional supplemental item (OR=0.98 for a 1-item increase; OR=0.79 for an increase from 0 to the maximum 12 supplemental items[2]). Even after controlling for the number of supplemental items linearly, there was a further drop in response rates associated with the first supplemental item; surveys with any supplemental items had lower adjusted

_____

[2] Up to 19 supplemental items were allowed for Medicare-Medicaid Plans (MMPs).

response rates (OR=0.87). Increasing the attractiveness rating of a given survey tends to increase its page count through the addition of white space and navigation cues. However, it would take about a 3-page increase in survey length (OR=0.91^3=0.75) to offset the increase in response propensity from a 1-point increase in attractiveness (inverse of OR=1/1.32=0.76). The correlation of plan-level response rates from 2010 and 2017 was 0.63 ($p<0.001$). The standard deviation of 2010 plan-level response rates was 10.6 percentage points. The adjusted odds ratio for a 1-standard deviation increase in 2010 response rate was 1.12, indicating that historically-higher response rate plans tended to have higher response rates in 2017, even after accounting for vendor, beneficiary, and survey characteristics.

In analyzing the association between survey characteristics and adjusted plan-level response rates (Table 3), we estimate that a plan with maximum survey attractiveness, shortest observed page length among surveys with maximum attractiveness (11 pages), and no supplemental items would have a 46.8% response rate. A plan with average survey attractiveness, page length, and number of supplemental items is estimated to have a 42.6% response rate. Finally, the response rate estimated for a plan with minimum survey attractiveness, longest observed page length among surveys with minimum attractiveness (8 pages), and 12 supplemental items is only 32.0%. The maximum response rate is substantially higher than the average and the minimum, indicating that response rates might be improved in many plans if mail survey characteristics were altered.

Interactions of beneficiary age with survey attractiveness, page count, and number of supplemental items were significant (Table 4; complete results shown in Appendix F). Controlling for other beneficiary characteristics, response propensity was more sensitive to changes in survey length and layout among older than among younger beneficiaries (i.e., odds ratios for response were farther from 1 for older age groups than for younger groups). As shown in Table 3, for 65-year-old beneficiaries, the difference in estimated plan-level response rates for the most favorable versus the least favorable survey design was 13.6 percentage points (45.9% vs. 32.3%), whereas for 80-year-old beneficiaries, the difference was 21.0 percentage points (54.1% vs. 33.1%).

DISCUSSION

The MA CAHPS survey employs substantial standardization – CMS approves and trains vendors that must follow detailed specifications in the Quality Assurance Protocols and Technical Specifications (Health Services Advisory Group, 2018b, 2018c). Nonetheless, even for such a highly-standardized survey, design variations may substantially influence response rates. Our results show that many design features previously identified as associated with higher response rates in systematic reviews (Edwards et al., 2002; Fox et al., 1988; Kanuk & Berenson, 1975) are independently associated with response rates within the context of a single survey administration. Summarizing across all age groups, we find that the attractiveness of the survey (defined by the use of color, white space, and use of cues to navigate

among questions and to distinguish response options from questions),
survey length, and (lower) number of supplemental items have a strong,
positive relationship with response propensity, controlling for beneficiary
characteristics.

Unlike prior research, this study had the sample size and variation in survey
design attributes to detect the effects of a variety of design features and
their heterogeneous affects by the characteristics of potential respondents.
We found that older beneficiaries may be especially sensitive to survey
layout and length. When allowed to vary by age, the estimated effects of
survey characteristics on response propensity are weaker (though still
significant) among younger adults and stronger among older adults. Physical
medicine and rehabilitation survey designers and researchers recognize the
need to ensure that there is a match between a potential respondent's
functional capacity and the functional demands of an assessment, such as a
survey questionnaire (Kramer & Schwartz, 2017). Many older adults will
have cognitive disabilities resulting from a stroke or other health event or
may have worse visual acuity (including less ability to discriminate print).
Based on these results, we recommend that survey sponsors consider
additional specifications regarding mail survey formatting that promote an
attractive layout (and reduce respondent demands), since changes such as
use of color, increased white space, and cues to navigate among questions
and better distinguish response options from questions may increase
response rates. Although such changes could increase survey length and

fielding cost, we find that it takes a 3-page increase in length (an increase of around 40% for a 7-to-8-page survey) to offset the gains in response propensity from a 1-point increase in survey attractiveness. Therefore, it appears feasible to increase response rates by improving layout attractiveness, even if this lengthens surveys by a modest amount. Seemingly small variations in survey layout may have a particularly pronounced effect on response rates for subgroups at risk for cognitive disabilities and with low response propensities.

A moderately-strong correlation of plan response rates with their response rate seven years prior even after accounting for beneficiary demographics and survey layout suggests that plans may vary substantially in other unmeasured factors that contribute to survey participation (e.g., quality of contact information, the perceived legitimacy of the plan, member engagement, whether plan members are over-surveyed(Benkí, Broome, Conrad, Groves, & Kreuter, 2011; Couper, Singer, Conrad, & Groves, 2008; Groves, Cialdini, & Couper, 1992; Groves, O'Hare, Gould-Smith, Benkí, & Maher, 2007)) Such factors if identified, might point the way towards further improving response rates.

This study has several limitations. First, because this is observational data, caution should be exercised in attributing observed differences in response rates to the measured aspects of design. There are known inter-vendor variations in response rates not fully explained by our variables, so it is difficult to estimate the true association between survey characteristics and

response rates. In addition, we used total response rate for a mail survey with telephone follow-up as our outcome to ensure that any apparent gains in mail response rates were not offset by losses in telephone response rates. This approach leaves open the possibility that results might be sensitive to vendor variation in telephone response rates, although a sensitivity test limited to mail responses found similar effects to those observed with total response rate.   Previous experiments have found that manipulation of survey appearance may affect response rates by as much as 16.5% (Edwards et al., 2002; Jansen, 1985). A controlled experiment could allow manipulation of these two survey characteristics to find the optimal combination of page length and attractiveness for a fixed set of survey items. Future work could suggest specific design points and derive recommended margins, font size, and other aspects of formatting that contributed to attractiveness.

References

Agency for Healthcare Research and Quality. (2018). CAHPS Health Plan
Survey Measures. Retrieved from https://www.ahrq.gov/cahps/surveys-guidance/hp/about/survey-measures.html

America's Health Insurance Plans Center for Policy and Research. (2015).
Medicare Advantage Demographics Report. Retrieved from Washington
DC:
https://www.ahip.org/wp-content/uploads/2015/02/MADemo_Report2015.pdf

Beckett, M. K., Elliott, M. N., Gaillot, S., Haas, A., Dembosky, J. W., Giordano,
L. A., & Brown, J. (2016). Establishing Limits for Supplemental Items on
a Standardized National Survey. *Public Opinion Quarterly, 80*(4), 964-976. doi:10.1093/poq/nfw028

Beebe, T. J., Davern, M. E., McAlpine, D. D., Call, K. T., & Rockwood, T. H.
(2005). Increasing response rates in a survey of Medicaid enrollees:
the effect of a prepaid monetary incentive and mixed modes (mail and
telephone). *Med Care, 43*(4), 411-414.

Benkí, J., Broome, J., Conrad, F., Groves, R. M., & Kreuter, F. (2011). *Effects
of Speech Rate, Pitch, and Pausing on Survey Participation Decisions*.
Paper presented at the American Association for Public Opinion
Research Annual Meeting, Phoenix, AZ.
https://pdfs.semanticscholar.org/8e2d/7c8e52ceb43dde2a95dc96aa8e99e0495333.pdf

Centers for Medicare & Medicaid Services. (2018). Payment Adjustment

Information. *Physician Quality Reporting System.* Retrieved from

https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-

Instruments/PQRS/Payment-Adjustment-Information.html

Couper, M. P., Singer, E., Conrad, F. G., & Groves, R. M. (2008). Risk of

Disclosure, Perceptions of Risk, and Concerns about Privacy and

Confidentiality as Factors in Survey Participation. *Journal of official*

statistics, 24(2), 255-275. Retrieved from

https://www.ncbi.nlm.nih.gov/pubmed/21603156

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3096944/

de Rada, V. D. (2005). Influence of questionnaire design on response to mail

surveys. *International Journal of Social Research Methodology, 8*(1),

61-78. doi:10.1080/1364557021000025991

Dillman, D. A., Sinclair, M. D., & Clark, J. R. (1993). Effects of Questionnaire

Length, Respondent-Friendly Design, and a Difficult Question on

Response Rates for Occupant-Addressed Census Mail Surveys. *The*

Public Opinion Quarterly, 57(3), 289-304. Retrieved from

http://www.jstor.org/stable/2749091

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, Phone, Mail,*

and Mixed-Mode Surveys: The Tailored Design Method (4th Edition

ed.). Hoboken, NJ: John Wiley & Sons, Inc.

Edwards, P., Roberts, I., Clarke, M., DiGuiseppi, C., Pratap, S., Wentz, R., &

Kwan, I. (2002). Increasing response rates to postal questionnaires:

systematic review. *BMJ, 324*(7347), 1183.
doi:10.1136/bmj.324.7347.1183

Elliott, M. N., Brown, J. A., Lehrman, W. G., Beckett, M. K., Hambarsoomian, K., Giordano, L. A., & Goldstein, E. H. (2013). A randomized experiment investigating the suitability of speech-enabled IVR and Web modes for publicly reported surveys of patients' experience of hospital care. *Med Care Res Rev, 70*(2), 165-184. doi:10.1177/1077558712464907

Fowler, F. J., Jr., Gallagher, P. M., Stringfellow, V. L., Zaslavsky, A. M., Thompson, J. W., & Cleary, P. D. (2002). Using telephone interviews to reduce nonresponse bias to mail surveys of health plan members. *Med Care, 40*(3), 190-200.

Fox, R. J., Crask, M. R., & Kim, J. (1988). Mail Survey Response Rate: A Meta-Analysis of Selected Techniques for Inducing Response. *The Public Opinion Quarterly, 52*(4), 467-491. Retrieved from http://www.jstor.org/stable/2749256

Graubard, B. I., & Korn, E. L. (1999). Predictive margins with survey data. *Biometrics, 55*(2), 652-659.

Groves, R. M., Cialdini, R. B., & Couper, M. P. (1992). Understanding The Decision to Participate in a Survey. *The Public Opinion Quarterly, 56*(4), 475-495. Retrieved from http://www.jstor.org/stable/2749203

Groves, R. M., O'Hare, B. C., Gould-Smith, D., Benkí, J., & Maher, P. (2007). Telephone Interviewer Voice Characteristics and the Survey

Participation Decision. In *Advances in Telephone Survey Methodology* (pp. 385-400).

Groves, R. M., & Peytcheva, E. (2009). The impact of nonresponse rates on nonresponse bias: a meta-analysis. *Public Opinion Quarterly, 72*(2), 167-189.

Health Services Advisory Group. (2018a). Medicare Advantage and Prescription Drug Plan CAHPS® Survey,. Retrieved from https://www.ma-pdpcahps.org/en/

Health Services Advisory Group. (2018b). Quality Assurance. *Medicare Advantage and Prescription Drug Plan CAHPS® Survey.* Retrieved from https://www.ma-pdpcahps.org/en/quality-assurance/

Health Services Advisory Group. (2018c). Technical Specifications. Retrieved from https://www.ma-pdpcahps.org/en/technical-specifications/

Hunsaker, A., & Hargittai, E. (2018). A review of Internet use among older adults. *New Media & Society, 20*(10), 3937-3954. doi:10.1177/1461444818787348

Jansen, J. H. (1985). Effect of Questionnaire Layout and Size and Issue-Involvement on Response Rates in Mail Surveys. *Perceptual and Motor Skills, 61*(1), 139-142. doi:10.2466/pms.1985.61.1.139

Kanuk, L., & Berenson, C. (1975). Mail Surveys and Response Rates: A Literature Review. *Journal of Marketing Research, 12*(4), 440-453. doi:10.2307/3151093

Klein, D. J., Elliott, M. N., Haviland, A. M., Saliba, D., Burkhart, Q., Edwards, C.,
      & Zaslavsky, A. M. (2011). Understanding Nonresponse to the 2007
      Medicare CAHPS Survey. *The Gerontologist, 51*(6), 843-855.
      doi:10.1093/geront/gnr046

Kramer, J. M., & Schwartz, A. (2017). Reducing Barriers to Patient-Reported
      Outcome Measures for People With Cognitive Impairments. *Arch Phys*
      Med Rehabil, 98(8), 1705-1715. doi:10.1016/j.apmr.2017.03.011

Morath, J. (2017). Analysis Finds HCAHPS Response Rates Matter. Retrieved
      from https://www.calhospital.org/cha-news-article/analysis-finds-
      hcahps-response-rates-matter

Roland, M., Elliott, M., Lyratzopoulos, G., Barbiere, J., Parker, R. A., Smith,
      P., . . . Campbell, J. (2009). Reliability of patient responses in pay for
      performance schemes: analysis of national General Practitioner Patient
      Survey data in England. *BMJ, 339*, b3851. doi:10.1136/bmj.b3851

Saunders, C. L., Elliott, M. N., Lyratzopoulos, G., & Abel, G. A. (2016). Do
      Differential Response Rates to Patient Surveys Between Organizations
      Lead to Unfair Performance Comparisons?: Evidence From the English
      Cancer Patient Experience Survey. *Med Care, 54*(1), 45-54.
      doi:10.1097/mlr.0000000000000457

Schnaier, J. A., Sweeny, S. F., Williams, V. S., Kosiak, B., Lubalin, J. S., Hays,
      R. D., & Harris-Kojetin, L. D. (1999). Special issues addressed in the
      CAHPS survey of Medicare managed care beneficiaries. Consumer
      Assessment of Health Plans Study. *Med Care, 37*(3 Suppl), Ms69-78.

Shih, T.-H., & Xitao, F. (2008). Comparing Response Rates from Web and Mail

    Surveys: A Meta-Analysis. *Field Methods, 20*(3), 249-271.

    doi:10.1177/1525822X08317085

Table 1. Number of MA Plans, Mean Page Count, and Mean Number of Supplemental Items by Vendor

	All Plans		Plans with MA-PD Surveys		Plans with MA-Only Surveys		Mean Page Count		Mean Number of Supplemental Items	
	N	%	N	%	N	%	MA-PD	MA-Only	MA-PD	MA-Only
Vendor 1	30	7	30	7	8	6	11.7	10.6	9.9	10.5
Vendor 2	16	4	16	4	0	0	8.4	NA	2.5	NA
Vendor 3	175	40	172	40	64	48	8.4	7.2	3.2	2.0
Vendor 4	95	22	91	21	24	18	8.4	7.9	5.4	3.0
Vendor 5	119	27	116	27	34	26	7.6	7.1	3.3	3.4
Vendor 6	3	1	2	0	2	2	8.0	8.0	0.0	0.0

Table 2. Multivariate Model Predicting 2017 Survey Response from Plan-Level Survey Characteristics (488,888 Beneficiaries Sampled from 438 MA Plans)

	OR (95% CI)	p-value	sig
Plan's 2010 response rate, per 10 percentage points	1.11 (1.08, 1.15)	<.0001	***
Instructions at top of first page of survey (as opposed to a separate page)	0.67 (0.56, 0.79)	<.0001	***
Attractiveness (1=least attractive/easy to read to 4=most attractive/easy to read)	1.32 (1.15, 1.52)	<.0001	***
Page count (recoded such that 0=modal value within survey type [8 for MA-PD, 7 for MA-Only])	0.91 (0.86, 0.95)	<.0001	***
Number of supplemental items	0.98 (0.97, 0.99)	0.0004	***
Any supplemental items	0.87 (0.78, 0.98)	0.0268	*
Characteristics of supplemental items	p=0.0002 for omnibus test		
Any CAHPS	1.13 (1.01, 1.26)	0.0354	*
Any non-CAHPS	1.15 (1.05, 1.26)	0.0026	**
Any open-ended	1.08 (1.00, 1.17)	0.0579	
Back of survey lists one or more additional names for the plan	0.93 (0.86, 1.00)	0.0482	*

Model includes fixed effects for survey type, vendor, and missing 2010 response rate; fixed effects for beneficiary age, race/ethnicity, gender, low-income status, and urbanicity; and random effects for plans.

*p<0.05, **p<0.01, ***p<0.001

Table 3. Predicted Response Rates for Plans with Different Survey Characteristics

Survey Characteristics	Predicted Response Rate		
	All Ages[1]	Age 65-69[2]	Age 80-84[2]
Least respondent burden: maximum survey attractiveness (4), shortest observed page length among surveys with maximum attractiveness (11), no supplemental items	46.8%	45.9%	54.1%
Average plan: attractiveness 2.53, page length 0.42 pages over modal value, 3.88 supplemental items; indicator values 0.49 for any supplemental items, 0.40 for CAHPS and 0.41 for non-CAHPS supplemental items, 0.19 for open-ended supplemental items	42.6%	42.2%	47.8%
Most respondent burden: minimum survey attractiveness (1), longest observed page length among surveys with minimum attractiveness (8), maximum supplemental items (12), some CAHPS and some non-CAHPS supplemental items	32.0%	32.3%	33.1%

[1]From main effects model without interactions of survey characteristics and age

[2]From model including interactions of survey characteristics and age

Response rates are adjusted for survey type; vendor; the plan's 2010 response rate; beneficiary race/ethnicity, gender, low-income status, and urbanicity; and random effects for plans.

Table 4. Multivariate Model Predicting 2017 Survey Response, with Interactions of Beneficiary Age and Plan-Level Survey Characteristics (488,888 Beneficiaries Sampled from 438 MA Plans)

	OR	p-value	sig
Plan's 2010 response rate, per 10 percentage points	1.09 (1.06, 1.12)	<.0001	***
Instructions at top of first page of survey (as opposed to a separate page)	0.68 (0.57, 0.80)	<.0001	***
Attractiveness (1=least attractive/easy to read to 4=most attractive/easy to read)	1.17 (1.01, 1.35)	0.0312	*
Page count (recoded such that 0=modal value within survey type [8 for MA-PD, 7 for MA-Only])	0.93 (0.88, 0.99)	0.0298	*
Number of supplemental items	1.00 (0.99, 1.02)	0.4887	
Any supplemental items	0.87 (0.77, 0.98)	0.0225	*
Characteristics of supplemental items	p<.0001 for omnibus test		
Any CAHPS	1.14 (1.02, 1.27)	0.0228	*
Any non-CAHPS	1.15 (1.05, 1.27)	0.0027	**
Any open-ended	1.09 (1.00, 1.18)	0.0405	*
Back of survey lists one or more additional names for the plan	0.95 (0.88, 1.03)	0.2229	
Beneficiary age			
18-34	0.46 (0.42, 0.49)	<.0001	***
35-44	0.51 (0.48, 0.55)	<.0001	***
45-54	0.66 (0.64, 0.69)	<.0001	***
55-64	0.89 (0.86, 0.91)	<.0001	***
65-69 (reference group)	1.00		
70-74	1.05 (1.03, 1.08)	<.0001	***
75-79	1.12 (1.08, 1.16)	<.0001	***

80-84	1.11 (1.06, 1.16)	<.0001	***
85-89	0.97 (0.92, 1.03)	0.3614	
90+	0.69 (0.64, 0.74)	<.0001	***
Linear age category x survey characteristics			
Joint test for all interactions (3 degrees of freedom)		<.0001	***
Age x attractiveness	1.02 (1.02, 1.03)	<.0001	***
Age x page count	0.99 (0.99, 1.00)	0.0230	*
Age x number of supplemental items	1.00 (1.00, 1.00)	<.0001	***

Model includes fixed effects for survey type, vendor, and missing 2010 response rate; fixed effects for beneficiary race/ethnicity, gender, low-income status, and urbanicity; and random effects for plans.

*p<0.05, **p<0.01, ***p<0.001

Appendix A. Mail Survey Characteristics

Variable	Values	Notes
Information about the survey booklet		
Survey version	0=MA-PD 1=MA-only	Some plans had both an MA-only and an MA-PD survey version; both versions were reviewed and coded.
Placement of instructions to beneficiary for completing the survey	0=on separate page 1=top of first page of survey	
Whether additional market names for the plan were displayed on the back of the survey	0=No 1=Yes	
Number of pages	Count	
Attractiveness (assessment of mail survey booklet for respondent friendly design based on use of color, visual cues to distinguish survey questions from response options, use of white space, and clear navigation cues)	4=most respondent friendly design 3=second most respondent friendly design 2=third most respondent friendly design 1=least respondent friendly design	Survey templates were arrayed and most and least respondent friendly designs were identified. Remaining templates were rank ordered in comparison to the most/ least respondent friendly. Approach resulted in four numeric values for coding (1-4). All vendor mail survey booklets were reviewed and assigned to one of the four categories. See Appendix B for more detail.

Variable	Values	Notes
Number of supplemental items	Minimum value is 0, Maximum value is 12[3]	
Supplemental items included one or more existing CAHPS items developed by the CAHPS consortium	0=No 1=Yes	
Supplemental items included one or more non-CAHPS items	0=No 1=Yes	
Any open-ended supplemental items (free response rather than choice of response options)	0=No 1=Yes	

---

[31] For Medicare-Medicaid Plans (MMPs), the maximum is 19 supplemental items.

Appendix B. Description of Respondent Friendly Survey Design and Coding of Attractiveness

The "attractiveness" variable provides an assessment of a given mail survey booklet for "respondent friendly design" based on the principles established by Dillman as influencing response rates and quality of data: use of color, presence of visual cues to distinguish survey questions from response options, presence and use of white space to help the respondent distinguish questions, and clear navigation cues.[45]

Survey templates were arrayed and most and least respondent friendly designs were identified, and the features of those templates were codified for use in coding the survey attractiveness variable. Vendors were required to use a minimum of 11-point font and no vendor used font larger than 12-point. In addition, all survey templates had similar page margins (side, top, bottom) due to use of scanning software for data entry and similar requirements for page margins across such software. As a result, font size and page margins were not factors in the development of our coding scheme for survey templates.

Features of the most respondent friendly design (Attractiveness = 1)

- Use of accent color

- Additional navigation cues to call out section headings

- More than one blank line between survey questions

- White space between survey question-response option block is larger than white space between a survey question and response options associated with the question

- One or more blank lines between end of survey question and start of response options

- A line or other demarcation between columns of survey questions

- Visible or extra white space on the survey page

---

[4] Dillman, D. A., Sinclair, M. D., & Clark, J. R. (1993). Effects of questionnaire length, respondent-friendly design, and a difficult question on response rates for occupant-addressed census mail surveys. *Public Opinion Quarterly*, *57*(3), 289-304.

[5] Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: the tailored design method*. John Wiley & Sons.

Features of the least respondent friendly design (Attractiveness = 4)

- No use of color; black and white only

- No additional navigation cues to call out section headings

- No blank lines between survey questions

- No blank lines between end of survey question and start of response options

- No line or other demarcation between columns of survey questions

- No visible or extra white space on the survey page

After defining the anchors of the attractiveness scale, the remaining surveys were ordered based on the respondent friendliness of the survey template in comparison to the most/least respondent friendly templates. This approach resulted in four numeric values for coding (1-4). All vendor mail survey booklets were reviewed and assigned to one of the four categories.

Features of the second most respondent friendly design (Attractiveness = 2)

- May use accent color

- No additional navigation cues to call out section headings

- One blank line between survey questions

- White space between survey question-response option block is larger than white space between a survey question and response options associated with the question

- One-half to one blank line between end of survey question and start of response options

- A line or other demarcation between columns of survey questions

- Visible or extra white space on the survey page

Features of the third most respondent friendly design (Attractiveness = 3)

- No use of accent color

- No additional navigation cues to call out section headings

- One-half to one blank line between survey questions

- White space between survey question-response option block is equal to white space between a survey question and response options associated with the question

- One-half to one blank line between end of survey question and start of response options

- A line or other demarcation between columns of survey questions

Appendix C. Variation of Survey Characteristics by Vendor (# of Surveys)

	Vendor 1		Vendor 2		Vendor 3		Vendor 4		Vendor 5		Vendor 6		Total	
	MA-PD	MA-Only	MA-PD	MA-Only	MA-PD	MA-Only	MA-PD	MA-Only	MA-PD	MA-Only	MA-PD	MA-Only	MA-PD	MA-Only
Placement of Survey Instructions														
On a separate page	30	0	16	0	172	64	91	24	116	34	2	2	427	124
Top of first page of the survey	0	8	0	0	0	0	0	0	0	0	0	0	0	8
Survey Attractiveness														
4 -- Most attractive	30	8	0	0	0	0	0	0	0	0	0	0	30	8
3	0	0	0	0	172	64	91	24	5	3	2	2	270	93
2	0	0	16	0	0	0	0	0	0	0	0	0	16	0
1 -- Least attractive	0	0	0	0	0	0	0	0	111	31	0	0	111	31
Any CAHPS Supplemental Survey Items														
Yes	26	7	6	0	51	13	45	12	49	15	0	0	177	47
No	1	0	1	0	0	0	37	7	5	0	0	0	44	7
Not applicable	3	1	9	0	121	51	9	5	62	19	2	2	206	78
Any Non-CAHPS Supplemental Survey Items														

	Vendor 1		Vendor 2		Vendor 3		Vendor 4		Vendor 5		Vendor 6		Total	
	MA-PD	MA-Only	MA-PD	MA-Only	MA-PD	MA-Only	MA-PD	MA-Only	MA-PD	MA-Only	MA-PD	MA-Only	MA-PD	MA-Only
Yes	22	7	4	0	43	12	74	18	37	13	0	0	180	50
No	5	0	3	0	8	1	8	1	17	2	0	0	41	4
Not applicable	3	1	9	0	121	51	9	5	62	19	2	2	206	78
Any Open-Ended Supplemental Survey Items														
Yes	0	0	0	0	1	0	50	17	25	11	0	0	76	28
No	27	7	7	0	50	13	32	2	29	4	0	0	145	26
Not applicable	3	1	9	0	121	51	9	5	62	19	2	2	206	78
Additional Market Names on Back of Survey														
Yes	0	0	0	0	0	0	1	1	73	28	2	2	76	31
No	30	8	16	0	172	64	90	23	43	6	0	0	351	101

Appendix D. Beneficiary and Survey Characteristics at the Beneficiary Level

	N	%
Beneficiary characteristics		
Age		
18-34	6,975	1.4
35-44	11,655	2.4
45-54	23,122	4.7
55-64	49,278	10.1
65-69	96,197	19.7
70-74	113,348	23.2
75-79	79,475	16.3
80-84	52,484	10.7
85-89	33,777	6.9
90+	22,577	4.6
Race/ethnicity		
White	349,770	71.5
Black	72,577	14.9
Asian	18,891	3.9
Hispanic	26,868	5.5
Other	20,782	4.3
Male	207,030	42.4
Dually eligible/receive Low Income Supplement	187,190	38.3
Beale Code		
1 (most urban; county in metro area of 1 million population or more)	266,126	54.4
2 (county in metro area of 250,000 to 1 million population)	125,525	25.7
3 (county in metro area of	40,744	8.3

fewer than 250,000 population)		
4 (county with urban population of 20,000 or more, adjacent to a metro area)	20,340	4.2
5-9 (most rural)	36,153	7.4
	Mean (Standard Deviation)	**Range**
Survey characteristics (at the beneficiary level)		
Plan's 2010 response rate (%)	62.4 (10.1)	25.8 – 81.6
Page count	8.3 (1.1)	7 - 12
Number of supplemental items	4.1 (5.2)	0 - 19
	N	**%**
Missing 2010 response rate	197,970	40.5
Instructions at top of first page of survey (as opposed to a separate page)	765	0.2
Attractiveness		
1 (least attractive/easy to read)	136,354	27.9
2	13,994	2.9
3	313,792	64.2
4 (most attractive/easy to read)	24,748	5.1
Any supplemental items	250,274	51.2
Characteristics of supplemental items		
Any CAHPS	202,447	41.4

Any non-CAHPS	205,240	42.0
Any open-ended	83,296	17.0
Back of survey lists one or more additional names for the plan	95,572	19.6
MA-Only survey	21,011	4.3
Vendor		
1	24,748	5.1
2	13,994	2.9
3	206,889	42.3
4	100,754	20.6
5	140,314	28.7
6	2,189	0.5

Appendix E. Complete Results from Multivariate Model Predicting 2017 Survey Response from Plan-Level Survey Characteristics (488,888 Beneficiaries Sampled from 438 MA Plans)

	OR (95% CI)	p-value	sig
Plan's 2010 response rate, per 10 percentage points	1.11 (1.08, 1.15)	<.0001	***
Missing 2010 response rate	0.99 (0.95, 1.04)	0.7305	
Instructions at top of first page of survey (as opposed to a separate page)	0.67 (0.56, 0.79)	<.0001	***
Attractiveness (1=least attractive/easy to read to 4=most attractive/easy to read)	1.32 (1.15, 1.52)	<.0001	***
Page count (recoded such that 0=modal value within survey type [8 for MA-PD, 7 for MA-Only])	0.91 (0.86, 0.95)	<.0001	***
Number of supplemental items	0.98 (0.97, 0.99)	0.0004	***
Any supplemental items	0.87 (0.78, 0.98)	0.0268	*
Characteristics of supplemental items	p=0.0002 for omnibus test		
Any CAHPS	1.13 (1.01, 1.26)	0.0354	*
Any non-CAHPS	1.15 (1.05, 1.26)	0.0026	**
Any open-ended	1.08 (1.00, 1.17)	0.0579	
Back of survey lists one or more additional names for the plan	0.93 (0.86, 1.00)	0.0482	*
MA-Only survey	1.10 (1.06, 1.15)	<.0001	***

Vendor			
1	1.09 (0.95, 1.27)	0.2216	
2	1.27 (1.06, 1.53)	0.0104	*
3 (omitted reference group)	1.00		
4	0.90 (0.83, 0.97)	0.0055	**
5	1.71 (1.35, 2.19)	<.0001	***
6	1.15 (0.87, 1.51)	0.3213	
Beneficiary characteristics			
Age			
18-34	0.41 (0.39, 0.44)	<.0001	***
35-44	0.47 (0.45, 0.49)	<.0001	***
45-54	0.62 (0.60, 0.64)	<.0001	***
55-64	0.86 (0.84, 0.88)	<.0001	***
65-69 (omitted reference group)	1.00		
70-74	1.11 (1.09, 1.13)	<.0001	***

75-79	1.24 (1.21, 1.26)	<.0001	***
80-84	1.28 (1.25, 1.30)	<.0001	***
85-89	1.17 (1.14, 1.20)	<.0001	***
90+	0.86 (0.84, 0.89)	<.0001	***
Race/ethnicity			
White (omitted reference group)	1.00		
Black	0.87 (0.86, 0.89)	<.0001	***
Asian	0.60 (0.58, 0.62)	<.0001	***
Hispanic	0.80 (0.78, 0.83)	<.0001	***
Other	0.81 (0.79, 0.84)	<.0001	***
Male	0.94 (0.93, 0.95)	<.0001	***
Dually eligible/receive Low Income Supplement	1.03 (1.01, 1.05)	0.0003	***
Beale Code (1=most urban, 5=most rural; values of 5 or greater coded as 5)	1.06 (1.05, 1.06)	<.0001	***

Model includes random effects for plans.

*p<0.05, **p<0.01, ***p<0.001

Appendix F. Complete Results from Multivariate Model Predicting 2017 Survey Response, with Interactions of Beneficiary Age and Plan-Level Survey Characteristics (488,888 Beneficiaries Sampled from 438 MA Plans)

	OR	p-value	sig
Plan's 2010 response rate, per 10 percentage points	1.09 (1.06, 1.12)	<.0001	***
Missing 2010 response rate	1.01 (0.96, 1.05)	0.8252	
Instructions at top of first page of survey (as opposed to a separate page)	0.68 (0.57, 0.80)	<.0001	***
Attractiveness (1=least attractive/easy to read to 4=most attractive/easy to read)	1.17 (1.01, 1.35)	0.0312	*
Page count (recoded such that 0=modal value within survey type [8 for MA-PD, 7 for MA-Only])	0.93 (0.88, 0.99)	0.0298	*
Number of supplemental items	1.00 (0.99, 1.02)	0.4887	
Any supplemental items	0.87 (0.77, 0.98)	0.0225	*
Characteristics of supplemental items	p<.0001 for omnibus test		
Any CAHPS	1.14 (1.02, 1.27)	0.0228	*
Any non-CAHPS	1.15 (1.05, 1.27)	0.0027	**
Any open-ended	1.09 (1.00, 1.18)	0.0405	*
Back of survey lists one or more additional names for the plan	0.95 (0.88, 1.03)	0.2229	
MA-Only survey	1.16 (1.12, 1.21)	<.0001	***
Vendor			
1	1.07 (0.92, 1.24)	0.3606	
2	1.29 (1.07, 1.55)	0.0067	**

3 (omitted reference group)	1.00		
4	0.90 (0.84, 0.97)	0.0089	**
5	1.73 (1.35, 2.20)	<.0001	***
6	1.13 (0.86, 1.49)	0.3814	
Beneficiary age			
18-34	0.46 (0.42, 0.49)	<.0001	***
35-44	0.51 (0.48, 0.55)	<.0001	***
45-54	0.66 (0.64, 0.69)	<.0001	***
55-64	0.89 (0.86, 0.91)	<.0001	***
65-69 (reference group)	1.00		
70-74	1.05 (1.03, 1.08)	<.0001	***
75-79	1.12 (1.08, 1.16)	<.0001	***
80-84	1.11 (1.06, 1.16)	<.0001	***
85-89	0.97 (0.92, 1.03)	0.3614	
90+	0.69 (0.64, 0.74)	<.0001	***
Linear age category x survey characteristics			
Joint test for all interactions (3 degrees of freedom)		<.0001	***
Age x attractiveness	1.02 (1.02, 1.03)	<.0001	***
Age x page count	0.99 (0.99, 1.00)	0.0230	*
Age x number of supplemental items	1.00 (1.00, 1.00)	<.0001	***
Other beneficiary characteristics			
Race/ethnicity			
White (omitted reference group)	1.00		
Black	0.87 (0.86, 0.89)	<.0001	***
Asian	0.60 (0.58, 0.62)	<.0001	***
Hispanic	0.80 (0.78, 0.83)	<.0001	***
Other	0.82 (0.80, 0.85)	<.0001	***

Male	0.93 (0.92, 0.95)	<.0001	***
Dually eligible/receive Low Income Supplement	1.04 (1.02, 1.06)	<.0001	***
Beale Code (1=most urban, 5=most rural; values of 5 or greater coded as 5)	1.06 (1.05, 1.06)	<.0001	***

Model includes random effects for plans.

*p<0.05, **p<0.01, ***p<0.001