

## Prescription Medication Cost-Related Non-adherence among Medicare CAHPS Respondents: Disparity by Hispanic Ethnicity

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**Abstract: Purpose.** We examined whether there was disparity in prescription medication cost-related non-adherence (CRN) by Hispanic ethnicity among Medicare enrollees. **Methods.** Multivariate logistic regression, adjusting for race, other socio-demographic variables, health status, health care utilization, and patient rating of their personal physician, was used to examine association of Hispanic ethnicity with CRN using cross-sectional data from Medicare's Consumer Assessment of Healthcare Providers and Systems (CAHPS) survey (data collected in Spring 2007). **Results.** Hispanic respondents constituted 6.9% (unweighted  $n=22,304$ ) of the analytic sample (unweighted  $n=272,701$ ; response rate = 48%). Overall, 13.4% of respondents reported CRN; among Hispanics and non-Hispanics, 20.3% and 12.9% reported CRN, respectively,  $p<.0001$ . Adjusted odds ratio (95% CI) of reporting CRN in the past six months was 1.18 (1.08, 1.29) for Hispanic compared with non-Hispanic respondents. **Conclusions.** Hispanic ethnicity was significantly associated with CRN. More research is needed to understand interventions to eliminate the disparity for this minority group.

**Key words:** Disparities, Hispanic, ethnicity, race, minority, cost-related non-adherence, Medicare.

In 1985, the United States Department of Health and Human Services (DHHS) released a landmark report titled the *Report of the U.S. Department of Health and Human Services (HHS) Secretary's Task Force on Black and Minority Health*.<sup>1</sup> With this report, the federal government sought to increase the awareness of the disparity between the

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health status of minority racial/ethnic groups (Blacks, Hispanics, Asian/Pacific Islanders, and American Indians/Alaska Natives) and the majority racial group (Whites) in the U.S.<sup>2,3</sup> More recently, the initiative *Healthy People 2010* established the goal of eliminating racial/ethnic health disparities.<sup>4</sup> Additionally, in 2002 the Institute of Medicine issued a report *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care* which found that numerous published studies have shown that, compared with Whites, minorities were less likely to receive needed health care services, even after accounting for different clinical, socio-economic and access-related factors.<sup>5</sup>

Causes for this continual disparity are complex and incompletely understood. Several studies have examined the relationship of different factors with health disparities for minority groups, including institutional racism,<sup>2,6-7</sup> socioeconomic status,<sup>2,7,8-11</sup> the environment and neighborhood effects,<sup>8,10,12</sup> social capital (i.e., strengthening family and friendship ties, attending church),<sup>9,11-14</sup> lack of insurance,<sup>15-23</sup> biologic factors,<sup>8,24-26</sup> and (particularly relevant for the Hispanic ethnic group) immigration status/acculturation<sup>14,19,20,21,27-35</sup> and language/cultural barriers.<sup>36-42</sup>

The Hispanic ethnic group is the largest and fastest growing minority group in the U.S., currently constituting 15% of the U.S. population, projected to increase from 46.7 million to 132.8 million by 2050, at which point approximately one-third of U.S. residents will be Hispanic.<sup>33-44</sup> As a group, Hispanics compared with Whites tend to have less education and income, work in lower-paying jobs or jobs that do not provide health benefits, and are less likely to have health insurance, all of which have been shown to be associated with less access to care and poorer health.<sup>9,10,15,16-23,33,34,36,45</sup> Despite these barriers, Hispanics in the U.S. in some cases experience better health outcomes and survival, a finding that has been called the "Hispanic paradox."<sup>46-48</sup> Possible explanations for the paradox include social and cultural factors that are beneficial to health<sup>9,11</sup> and migration effects, with healthier people immigrating into the U.S. and older, sicker people migrating back to their land of birth, leaving a healthier cohort remaining in the U.S.<sup>46</sup> However, some investigators have not found an association of selective migration with health outcomes,<sup>52</sup> and others have suggested that methodological flaws in existing studies may account for the paradox.<sup>53</sup> Additionally, many studies were either conducted only among Mexican Americans or the investigators found the Hispanic paradox applied only to Mexican Americans.<sup>48,54,56-57</sup>

While numerous studies have been conducted examining disparity in access to health care and health outcomes between Hispanics and non-Hispanic Whites, there has been little research devoted to examining potential disparity between them in non-adherence to prescription medication. Non-adherence to prescription medication regimens has been shown to lead to subsequent adverse health events, including declining health status, more frequent visits to the emergency department, increased acute care hospital and nursing home admissions, and use of emergency mental health services.<sup>58</sup> While non-adherence can certainly be unintentional, previous studies have indicated that a significant percentage of people needing prescriptions report intentional non-adherence of some form.<sup>65-82</sup> Reasons for intentional prescription medication non-adherence involve various factors such as cost,<sup>65-82</sup> medication experiences or side effects,<sup>69,80</sup> complex drug regimens,<sup>69,71</sup> or lower self-perceived need for medication.<sup>76,80</sup>

Prior studies examining cost-related non-adherence to prescription medications

(CRN) have produced mixed results concerning possible association of race/ethnicity with CRN.<sup>69,70,73-76,79-81,83</sup> Two separate groups of investigators found that elderly (65 years or older) Blacks were more likely than Whites to report CRN.<sup>70,73</sup> Steinman et al. found that self-reported "minority race" (Blacks and Hispanics) was a significant predictor of CRN.<sup>81</sup> Those studies that reported no significant differences by race/ethnicity were often limited by not conducting multivariate analyses to control for potential confounders.<sup>73,76</sup>

There have been a limited number of studies addressing the relationship between CRN and Hispanic ethnicity. Kennedy and Erb, in a study of disabled, community-dwelling adults, 18 years or older (data from the National Health Interview Survey [NHIS] Supplemental Disability Follow-Back Survey, 1994–1995), found that the odds of Hispanic respondents reporting CRN were half those of White respondents after controlling for a variety of potential confounding factors.<sup>74</sup> Kennedy and colleagues in a trend analysis of the NHIS data, 1997–2002, found higher population estimates for CRN for Hispanic and Black respondents compared with Whites (6.7%, 8.3% and 5.5%, respectively,  $p < .001$ ).<sup>79</sup> The authors did not describe how they defined Hispanic, Black, and White individuals in either study, nor did they present multivariate models adjusted for potential confounders. A possible explanation for the discordance in findings from these two studies is that the earlier study was restricted to disabled individuals while the latter examined data from an adult non-institutionalized civilian population. Soumerai et al., examining data from the Fall 2004 Medicare Current Beneficiary Survey (MCBS), among non-elderly disabled and among elderly (65 years or older) respondents, found no significant difference in the percent of White and Hispanic respondents reporting CRN. However, these investigators did not report adjusted findings for the Hispanic ethnic group in their multivariate regression model predicting CRN.<sup>70</sup>

More recently, Gellad et al. examined CRN using data from a 2003 national survey of Medicare beneficiaries aged 65 years or older who reported their race/ethnicity and were taking at least one medication.<sup>83</sup> In their analyses, Blacks and Hispanics appeared to be more likely to report CRN than Whites until income was added to the model, at which point race/ethnicity became statistically non-significant.

Due to the paucity of information regarding the association of Hispanic ethnicity with CRN, as well as the inconsistency in findings from the few published studies, we examined self-reported CRN using data collected from a large, contemporary sample of Medicare enrollees who recalled their health care experience following the implementation of Medicare's Part D prescription drug benefit. We examined whether CRN was more prevalent among Hispanic/Latino (hereinafter referred to as Hispanic) Medicare enrollees than among non-Hispanic enrollees.

## Methods

**Study design and sample.** This cross-sectional study used data from the Medicare Consumer Assessment of Healthcare Providers and Systems Survey (Medicare CAHPS), a survey administered by the Centers for Medicare & Medicaid Services (CMS) in Spring 2007.<sup>84</sup> The Medicare CAHPS surveyed a national random sample of community-dwelling adult Medicare enrollees aged 18 years or older, stratified by

their Part D drug benefit enrollment status. A total of 695,197 Medicare enrollees were mailed the English version of the survey instrument. A Spanish-language version of the instrument was available to respondents who requested it; 42% of respondents who identified themselves as Hispanic used this version of the instrument. For enrollees who did not return a questionnaire, a computer-assisted telephone interview (CATI) was employed to augment response rate.

**Study variables.** *Dependent variable.* Our outcome variable was based on the response to the survey question, "In the last six months, did you ever delay or not fill a prescription because you felt that you could not afford it?" Possible responses included "Yes," "No," or "My doctor did not prescribe any medicines for me in the last six months." In our analysis, we included community-dwelling respondents who reported "Yes" or "No" to this question.

**Hispanic ethnicity and race.** The Medicare CAHPS questionnaire conformed to the federal recommended standard on collection of race and ethnicity in that respondents were asked to identify their ethnicity and race in two consecutive questions.<sup>85</sup> First, respondents were asked "Are you of Hispanic or Latino origin or descent?" which had two possible responses: 1) "Yes, Hispanic or Latino"; or 2) "No, not Hispanic or Latino." The next question asked "What is your race? Please mark one or more," with possible responses: "White," "Black or African American," "Asian, Native Hawaiian or other Pacific Islander," and "American Indian or Alaska Native (AIAN)."

We combined the Asian category with the Native Hawaiian or other Pacific Islander category to comprise the Asian/Pacific Islander (API) racial group. As respondents could select multiple racial categories, we created a "Multi-race" category if the respondent reported more than one race. Thus, our race group comprised White, Black, API, AIAN, Multi-race, and Race not reported.

**Covariates.** In addition to race, we controlled for risk factors that were considered conceptually important for assessing the association between Hispanic ethnicity and CRN. The CAHPS survey provided these factors: self-reported sociodemographics, health status measures, and the respondent's interactions with the health care system and providers. Additionally, respondent's rural/urban residence, a socioeconomic indicator, the CMS-Hierarchical Condition Category risk scores, the categorization of prescription drug coverage and low-income subsidy status were brought in from other administrative data sources (as described later).

Sociodemographic characteristics included gender, age, education, and rural/urban residence. The rural/urban status was created by merging the study data by the respondent's county of residence with a Core Based Statistical Areas crosswalk file.<sup>86</sup>

Because the CAHPS instrument did not include a question for income status, we constructed a socioeconomic indicator based on Krieger et al.'s methodology.<sup>87</sup> The respondent's mailing address was geocoded and linked with the 2000 U.S. Census to retrieve seven block-group level socioeconomic characteristics that included: 1) unemployment ("pct\_unemp"—percentage of persons aged 16 years or older in the labor force who were unemployed and actively seeking work); 2) income below the federal poverty level ("pct\_poverty"—percentage of persons below the federal poverty level); 3) median income ("hhinc100"—median household income that was standardized to range from 1 to 100 by subtracting the mean from each value and dividing by the

standard deviation); 4) median property value (“prop100”—median value of owner-occupied houses that was standardized to range from 0 to 100); 5) crowdedness in a household (“crowded”—percentage of households containing one or more person per room); 6) low education (“low\_educ”—percentage of persons aged 25 years or older with less than 12 years of education); and 7) high education (“high\_educ”—percentage of persons aged 25 years or older with at least 4 years of college education) in their corresponding neighborhood. A principal component analysis was performed to obtain the weight for each of the seven socioeconomic measures. The SES index scores were derived by multiplying each measure’s value by its corresponding weight and summing together as described here:  $SES\ Index\ Score = 50 + (-0.07 * crowded) + (0.08 * prop100) + (-0.10 * pct\_poverty) + (0.11 * hhinc100) + (0.10 * high\_educ) + (-0.11 * low\_educ) + (-0.08 * pct\_unemp)$ .<sup>85</sup> The measures with positive weights, that is, median property value, median income, and high education contributed to higher SES index scores that represent more optimal SES status.

We included a measure of prescription drug coverage. All Medicare enrollees became eligible for Medicare Part D prescription drug coverage on January 1, 2006 under the Medicare Modernization Act of 2003. Enrollees whose income and asset levels were below legislated thresholds were entitled to a Part D low-income subsidy (LIS) that reduced their monthly premium and cost-sharing liabilities. Those enrollees who were receiving Medicaid benefits, Supplemental Security Income (SSI) or Medicare Savings Programs (MSP) in addition to Medicare were automatically deemed to receive this subsidy (“deemed LIS”) and were automatically enrolled in a Part D plan.<sup>88–90</sup> Other low-income enrollees could apply for the subsidy and, if qualified, were identified as “non-deemed LIS.” We combined these two types of LIS enrollees as the *LIS group* in our analysis. Enrollees who were enrolled in a drug insurance plan at least as generous as the Part D benefit could remain in that plan without penalty; these plans include some employer health plans, veterans health benefits, military Tricare, federal employee health benefits, and state pharmacy assistance programs and are referred to as “Other creditable drug coverage.” In 2006, a few state pharmacy assistance programs did not require their beneficiaries to enroll in Part D; by 2007, however, this was no longer the case. Enrollment in a drug insurance plan was not mandatory, and a substantial number of Medicare enrollees remained uninsured for prescriptions in 2006. We categorized CAHPS respondents into four categories: “Part D, non-LIS,” “Part D, LIS,” “Other creditable drug coverage,” and “No known drug coverage.”

Respondents’ health status was captured by several variables. An Activities of Daily Living (ADL) disability score was derived from responses to a series of six questions regarding difficulty in bathing, dressing, eating, getting in or out of chairs, walking, or using the toilet. Response options for ADL were: “I am unable to do this activity,” “Yes, I have difficulty,” or “No, I do not have difficulty.” A dichotomous variable was created by combining the first two options (coded as 1) for each activity vs. the third option (coded as 0). A sum score was then created by summing up across the six questions. The final ADL disability score variable used for subsequent analyses had levels of difficulty with 0 (none), 1–2, and 3–6 activities based on univariate logistic regression results that showed differentiation in odds of CRN at these cut-points. Self-reported

general health status and mental health status ratings came from separate questions on the survey with likely responses of “poor,” “fair,” “good,” “very good,” and “excellent.”

To reflect the respondents’ disease burden, we also included a risk score created from the CMS–Hierarchical Condition Category (CMS-HCC) risk adjustment model for community-dwelling populations.<sup>91</sup> The model adjusts for diagnoses, age, sex, Medicaid eligibility, and original entitlement of Medicare (disability, End-Stage Renal Disease, or working aged). The risk score was created for each Medicare enrollee by using ICD-9 codes from the CMS administrative data files. Finally, a dichotomous smoking status included: “smoke cigarettes every day/some days” versus “smoke not at all.”

We also controlled for selected measures of involvement with the health care system. These measures included whether the respondent had a personal physician, the number of routine care visits in the past six months, and whether the respondent had a flu shot in the past influenza season. The respondent’s rating of his/her personal physician variable was constructed from his/her response to the question, “Using any number from 0–10, where 0 is the worst personal doctor possible and 10 is the best personal doctor possible, what number would you use to rate your personal doctor?” Because of the skip pattern built into the survey, only respondents who reported one or more visits to a personal physician in the last six months were asked to rate their physicians. We assigned the respondents who did not respond to this question due to the skip pattern as the “No Visit” group. We then grouped the remaining responses into categories based on univariate logistic regression results that showed differentiation in odds of CRN at these cut-points: 0–4, 5, 6–7, 8–9, and 10.

**Data analyses.** We computed weighted percentage distributions and 95% confidence intervals of the variables in our study for the total sample and for subgroups by Hispanic ethnicity and by CRN. However, the comparisons of respondents with non-respondents were not weighted because the weights were not available for non-respondents. Unadjusted and adjusted logistic regression models were fitted for the total sample and for subgroups by Hispanic ethnicity. Adjusted odds ratios (AORs) and 95% confidence intervals (CIs) were used to assess significance in adjusted models. We used the Taylor linear method to account for the complex sampling design of the CAHPS in our analyses. We conducted all analyses using STATA version 10.0 (StataCorp LP, College Station, TX. ©1996–2009). All statistical significance was at  $p < .05$  level.

## Results

**Sample characteristics.** Overall response to the 2007 CAHPS questionnaire was 48% (analytic sample  $n = 272,701$ , unweighted). Compared with the non-respondents, the respondents were slightly more likely to be female (60% vs. 58% of non-respondents), and less likely to be younger than 65 years old (18% vs. 22%). Since we relied on self-reported race and Hispanic ethnicity information, we could not compare respondents with non-respondents on these parameters.

Overall, 13.4% of respondents in the sample for analysis reported CRN. One fifth (20.3%) of Hispanic respondents reported CRN compared with 12.9% of non-Hispanic respondents ( $p < .0001$ ) (Table 1). Hispanic respondents differed from non-Hispanic

**Table 1.****SURVEY RESPONDENTS BY HISPANIC ETHNICITY IN  
MEDICARE CAHPS SURVEY CONDUCTED IN SPRING 2007<sup>a</sup>**

	Total (n=272,701) Percent (95% CI)	Hispanic (n=22,304) Percent (95% CI)	Non-Hispanic (n=250,397) Percent (95% CI)
Delayed filling or did not fill prescription medication in last 6 months	13.4 (12.4, 14.5)	20.3 (18.6, 22.0) <sup>b</sup>	12.9 (11.9, 14.0)
Race			
White	85.5 (83.8, 87.0)	68.7 (64.8, 72.3) <sup>b</sup>	86.7 (85.1, 88.2)
Black	7.5 (6.5, 8.5)	4.1 (3.1, 5.4) <sup>b</sup>	7.7 (6.7, 8.9)
Asian/Pacific Islander	1.9 (1.5, 2.5)	1.4 (1.1, 1.7)	1.9 (1.5, 2.6)
American Indian/ Alaska Native	0.6 (0.5, 0.7)	1.8 (1.5, 2.2) <sup>b</sup>	0.5 (0.4, 0.6)
Multi-race	2.2 (2.1, 2.4)	2.6 (2.1, 3.1)	2.2 (2.0, 2.4)
Race not reported	2.3 (2.0, 2.7)	21.5 (17.4, 26.2) <sup>b</sup>	0.9 (0.8, 1.0)
Female	57.5 (55.6, 59.3)	57.3 (55.9, 58.8)	57.5 (55.6, 59.4)
Age, years			
18-44	2.1 (1.6, 2.7)	3.3 (2.6, 4.1)	2.0 (1.6, 2.5)
45-64	11.2 (9.8, 12.7)	17.0 (15.4, 18.7) <sup>b</sup>	10.7 (9.4, 12.3)
65-74	48.1 (46.8, 49.3)	49.2 (47.5, 50.9)	48.0 (46.7, 49.3)
75-80	21.6 (20.9, 22.3)	18.2 (17.2, 19.2) <sup>b</sup>	21.8 (21.1, 22.5)
>80	17.1 (16.4, 17.9)	12.4 (11.7, 13.1) <sup>b</sup>	17.5 (16.7, 18.3)
High school graduate / GED	79.0 (76.8, 81.0)	48.9 (44.8, 53.0) <sup>b</sup>	81.1 (79.1, 83.0)
Rural residence	22.1 (19.0, 25.5)	9.2 (7.1, 11.8) <sup>b</sup>	23.0 (19.9, 26.6)
Socioeconomic status score			
1st quartile	25.0 (22.7, 27.5)	42.1 (38.8, 45.5) <sup>b</sup>	24.0 (21.8, 26.5)
2nd quartile	25.0 (23.7, 26.4)	22.3 (21.0, 23.8) <sup>b</sup>	25.2 (23.8, 26.5)
3rd quartile	25.0 (23.9, 26.1)	19.4 (17.7, 21.1) <sup>b</sup>	25.3 (24.2, 26.5)
4th quartile (the most affluent group)	25.0 (22.4, 27.8)	16.3 (14.3, 18.4) <sup>b</sup>	25.5 (22.8, 28.4)
Drug coverage			
Part D, non-LIS	38.5 (28.6, 49.5)	37.8 (26.7, 50.4)	38.6 (28.2, 50.1)
Part D, LIS	16.4 (12.0, 22.0)	32.1 (22.1, 44.1) <sup>b</sup>	15.3 (11.1, 20.6)
Other creditable drug coverage	16.0 (12.1, 20.8)	9.8 (5.9, 15.8)	16.4 (12.4, 21.4)
No known drug coverage	29.1 (21.5, 38.2)	20.3 (11.1, 34.2)	29.8 (21.9, 39.1)
ADL disability score			
0	61.1 (59.3, 62.9)	51.5 (48.9, 54.1) <sup>b</sup>	61.8 (60.1, 63.5)
1-2	25.3 (24.5, 26.1)	27.6 (26.4, 28.7) <sup>b</sup>	25.1 (24.4, 25.9)
3-6	13.6 (12.6, 14.7)	21.0 (19.1, 22.9) <sup>b</sup>	13.1 (12.1, 14.1)

*(Continued on p. 525)*

**Table 1. (continued)**

	Total (n=272,701) Percent (95% CI)	Hispanic (n=22,304) Percent (95% CI)	Non-Hispanic (n=250,397) Percent (95% CI)
<b>General health status</b>			
Excellent	6.9 (6.5, 7.4)	7.0 (6.4, 7.7)	6.9 (6.5, 7.4)
Very good	24.6 (23.5, 25.7)	17.0 (15.3, 18.8) <sup>b</sup>	25.2 (24.1, 26.3)
Good	35.4 (34.6, 36.1)	29.0 (27.8, 30.3) <sup>b</sup>	35.8 (35.1, 36.6)
Fair	24.9 (23.8, 26.0)	36.2 (33.3, 39.2) <sup>b</sup>	24.1 (23.0, 25.1)
Poor	8.2 (7.4, 9.1)	10.8 (9.6, 12.2) <sup>b</sup>	8.0 (7.2, 8.9)
<b>Mental health status</b>			
Excellent	28.9 (27.8, 30.2)	23.7 (22.6, 24.8) <sup>b</sup>	29.3 (28.1, 30.6)
Very good	31.3 (30.5, 32.1)	23.4 (21.5, 25.3) <sup>b</sup>	31.9 (31.2, 32.7)
Good	26.9 (26.2, 27.7)	30.5 (29.5, 31.6) <sup>b</sup>	26.7 (26.0, 27.4)
Fair	10.5 (9.5, 11.5)	18.7 (17.0, 20.7) <sup>b</sup>	9.8 (9.0, 10.8)
Poor	2.3 (2.1, 2.7)	3.7 (3.2, 4.3) <sup>b</sup>	2.2 (2.0, 2.5)
<b>Medicare HCC score</b>			
1st quartile (the healthiest group)	28.0 (26.7, 29.3)	23.5 (20.5, 26.8) <sup>b</sup>	28.3 (27.0, 29.6)
2nd quartile	22.0 (21.7, 22.4)	22.8 (21.5, 24.1)	22.0 (21.7, 22.3)
3rd quartile	25.0 (24.5, 25.5)	26.1 (25.0, 27.2)	24.9 (24.4, 25.4)
4th quartile	25.0 (24.0, 26.1)	27.6 (25.6, 29.8)	24.8 (23.8, 25.9)
<b>Smoking status</b>			
Never	89.0 (88.1, 89.9)	90.6 (89.5, 91.5)	88.9 (87.9, 89.8)
Some/all days	11.0 (10.1, 11.9)	9.4 (8.5, 10.5)	11.1 (10.2, 12.1)
Have a personal physician	94.8 (94.4, 95.2)	91.0 (89.9, 92.0) <sup>b</sup>	95.1 (94.7, 95.5)
<b>Number of routine care visits in last 6 months</b>			
0	13.1 (12.6, 13.6)	18.7 (17.9, 19.5) <sup>b</sup>	12.7 (12.2, 13.2)
1-2	40.4 (39.6, 41.2)	33.1 (31.1, 35.2) <sup>b</sup>	41.0 (40.2, 41.7)
3+	46.5 (45.5, 47.4)	48.2 (46.2, 50.3)	46.4 (45.4, 47.3)
<b>Respondent rating of personal physician<sup>c</sup></b>			
0-4	1.4 (1.4, 1.5)	1.4 (1.2, 1.7)	1.4 (1.4, 1.5)
5	2.1 (2.0, 2.2)	2.2 (1.8, 2.7)	2.1 (2.0, 2.2)
6-7	5.9 (5.7, 6.0)	4.7 (4.1, 5.4) <sup>b</sup>	6.0 (5.8, 6.1)
8-9	28.5 (27.9, 29.1)	19.8 (18.5, 21.3) <sup>b</sup>	29.1 (28.6, 29.6)
10	43.6 (42.8, 44.4)	52.3 (49.7, 54.9) <sup>b</sup>	42.9 (42.1, 43.8)
No visits	18.5 (17.8, 19.2)	19.5 (18.2, 20.9)	18.4 (17.7, 19.2)
<b>Received flu shot last influenza season</b>			
	71.6 (70.2, 72.9)	56.3 (49.8, 62.6) <sup>b</sup>	72.7 (71.5, 73.8)

<sup>a</sup>All results are weighted percentages and 95% confidence intervals. Percentages may not sum to 100 due to rounding.

<sup>b</sup>Values indicate statistical difference by Hispanic ethnicity at  $p < .05$  level.

<sup>c</sup>Ratings were applicable to respondents who reported one or more visits to a personal physician in the last 6 months. Rating scale 0-10: 0=worst personal doctor possible; 10=best personal doctor possible.

LIS = Part D Low-Income Subsidy

ADL = Activities of daily living

HCC = Hierarchical Condition Category



respondents in a number of the attributes that we considered in our model (Table 1). Constituting 6.9% of this sample (unweighted  $n=22,304$ ), Hispanic respondents were more likely to be younger, have less education, be in the lowest SES quartile, and report poorer health. They were less likely to have a personal physician or to have routine care visits; however, they rated their personal physicians better (all  $p$ -values  $< .0001$ ).

In Table 2 we present the bivariate analyses of respondent's attributes by CRN. Respondents who reported CRN were more likely to be Hispanic, of minority race, female, younger, and in lower SES quartiles; to have less education; and to report poorer health. They were more likely to report a lower satisfaction rating of their personal physician (all  $p$  values  $< .0001$ ).

**Logistic regression models.** Logistic regression models for the odds of CRN are presented in Table 3. The unadjusted logistic regression showed that Hispanic respondents were more likely to report CRN in the past six months than non-Hispanic respondents (OR=1.71; 95% CI=1.54, 1.90). After controlling for sociodemographic and SES factors, health status, health care utilization, and physician rating, the association remained statistically significant (AOR=1.18; 95% CI=1.08, 1.29).

In the Hispanic subgroup analysis, Hispanic respondents categorized as "Multi-race" or "Race not reported" were more likely to report CRN than the Hispanic Whites reference group (AOR=1.76; 95% CI=1.11, 2.79 and AOR=1.31; 95% CI=1.05, 1.63, respectively). Among non-Hispanic respondents, CRN was more likely to be reported among those who reported their race as Black (AOR=1.40; 95% CI=1.28, 1.54), AIAN (AOR=1.64; 95% CI=1.28, 2.10), or Multi-race (AOR=1.61; 95% CI=1.43, 1.82) than among the non-Hispanic White reference group.

In both adjusted models by Hispanic ethnicity, females were more likely to report CRN, as were respondents younger than 65 years old, and those with less education. The respondents who were in the lowest SES quartile and who reported poorer health were more likely to report CRN. Respondents who rated their personal physician 7-or-below on a 10-point scale (where 10 = best personal doctor possible) were also more likely to report CRN.

## Discussion

There have been a few reports examining the association of Hispanic ethnicity with CRN using data from 1994–1995, 1997–2002, 2003, and 2004.<sup>70,71,79,83</sup> This study helps to fill a gap in knowledge and updates information in this important area. This analysis of data from a large, contemporary survey of community-dwelling Medicare enrollees, demonstrates a statistically significant disparity between Hispanic and non-Hispanic respondents in self-reported CRN. This disparity remained statistically significant after controlling for several sociodemographic characteristics, SES, health status and health care utilization factors, and physician rating.

Our finding of significant disparity in reported CRN among racial/ethnic groups is similar to results reported by Kennedy and colleagues, who found higher population estimates of CRN among Blacks and Hispanics than among Whites in unadjusted analyses of NHIS data from 1997–2002.<sup>79</sup> Our finding stands in contrast to the Kennedy and Erb report that among disabled, community-dwelling adult respondents to the NHIS

**Table 2.**  
**SURVEY RESPONDENTS BY COST-RELATED**  
**NONADHERENCE STATUS (CRN) IN MEDICARE CAHPS**  
**SURVEY CONDUCTED IN SPRING 2007<sup>a</sup>**

	TOTAL (n=272,701) Percent (95% CI)	CRN=YES (n=43,727) Percent (95% CI)	CRN=NO (n=228,974) Percent (95% CI)
Hispanic ethnicity	6.9 (5.3, 8.9)	10.4 (7.7, 13.8)	6.3 (4.9, 8.1)
Race			
White	85.5 (83.8, 87.0)	77.7 (75.4, 79.8) <sup>b</sup>	86.7 (85.1, 88.1)
Black	7.5 (6.5, 8.5)	12.4 (11.0, 13.9) <sup>b</sup>	6.7 (5.9, 7.7)
Asian/Pacific Islander	1.9 (1.5, 2.5)	1.3 (1.0, 1.7)	2.0 (1.5, 2.6)
American Indian/ Alaska Native	0.6 (0.5, 0.7)	1.2 (1.0, 1.4) <sup>b</sup>	0.5 (0.4, 0.6)
Multi-race	2.2 (2.1, 2.4)	3.8 (3.5, 4.2) <sup>b</sup>	2.0 (1.8, 2.1)
Race not reported	2.3 (2.0, 2.7)	3.6 (3.0, 4.4) <sup>b</sup>	2.1 (1.8, 2.5)
Female	57.5 (55.6, 59.3)	63.4 (61.9, 64.9) <sup>b</sup>	56.6 (54.7, 58.4)
Age, years			
18-44	2.1 (1.6, 2.7)	5.6 (4.6, 6.7) <sup>b</sup>	1.5 (1.2, 2.0)
45-64	11.2 (9.8, 12.7)	28.0 (25.9, 30.3) <sup>b</sup>	8.6 (7.5, 9.8)
65-74	48.1 (46.8, 49.3)	41.5 (39.6, 43.4) <sup>b</sup>	49.1 (47.8, 50.3)
75-80	21.6 (20.9, 22.3)	15.4 (14.5, 16.4) <sup>b</sup>	22.5 (21.9, 23.2)
>80	17.1 (16.4, 17.9)	9.4 (8.7, 10.2) <sup>b</sup>	18.3 (17.5, 19.1)
High school graduate / GED	79.0 (76.8, 81.0)	71.7 (69.7, 73.7) <sup>b</sup>	80.1 (77.9, 82.1)
Rural residence	22.1 (19.0, 25.5)	24.3 (21.5, 27.4)	21.7 (18.6, 25.3)
Socioeconomic status score			
1st quartile	25.0 (22.7, 27.5)	34.3 (31.8, 36.8) <sup>b</sup>	23.6 (21.4, 26.0)
2nd quartile	25.0 (23.7, 26.4)	27.2 (26.2, 28.2) <sup>b</sup>	24.7 (23.3, 26.1)
3rd quartile	25.0 (23.9, 26.1)	22.2 (21.0, 23.5) <sup>b</sup>	25.4 (24.3, 26.5)
4th quartile (the most affluent group)	25.0 (22.4, 27.8)	16.3 (14.7, 18.1) <sup>b</sup>	26.3 (23.6, 29.2)
Drug coverage			
Part D, non-LIS	38.5 (28.6, 49.5)	39.6 (30.6, 49.3)	38.4 (28.2, 49.6)
Part D, LIS	16.4 (12.0, 22.0)	26.8 (20.5, 34.2) <sup>b</sup>	14.8 (10.7, 20.1)
Other creditable drug coverage	16.0 (12.1, 20.8)	10.0 (7.2, 13.7)	16.9 (12.8, 21.8)
No known drug coverage	29.1 (21.5, 38.2)	23.6 (16.7, 32.2)	30.0 (22.2, 39.1)
ADL disability score			
0	61.1 (59.3, 62.9)	39.4 (37.7, 41.1) <sup>b</sup>	64.5 (62.9, 66.1)
1-2	25.3 (24.5, 26.1)	34.5 (33.7, 35.3) <sup>b</sup>	23.9 (23.1, 24.6)
3-6	13.6 (12.6, 14.7)	26.1 (24.8, 27.5) <sup>b</sup>	11.6 (10.8, 12.6)

(Continued on p. 528)

**Table 2. (continued)**

	TOTAL (n=272,701) Percent (95% CI)	CRN=YES (n=43,727) Percent (95% CI)	CRN=NO (n=228,974) Percent (95% CI)
General health status			
Excellent	6.9 (6.5, 7.4)	2.9 (2.7, 3.2) <sup>b</sup>	7.6 (7.1, 8.0)
Very good	24.6 (23.5, 25.7)	12.7 (11.8, 13.7) <sup>b</sup>	26.5 (25.4, 27.5)
Good	35.4 (34.6, 36.1)	29.9 (28.3, 31.5) <sup>b</sup>	36.2 (35.6, 36.9)
Fair	24.9 (23.8, 26.0)	36.3 (34.9, 37.8) <sup>b</sup>	23.1 (22.1, 24.2)
Poor	8.2 (7.4, 9.1)	18.1 (16.8, 19.5) <sup>b</sup>	6.7 (6.0, 7.4)
Mental health status			
Excellent	28.9 (27.8, 30.2)	19.0 (17.9, 20.1) <sup>b</sup>	30.5 (29.4, 31.6)
Very good	31.3 (30.5, 32.1)	25.1 (24.0, 26.2) <sup>b</sup>	32.3 (31.6, 33.1)
Good	26.9 (26.2, 27.7)	30.1 (29.5, 30.7) <sup>b</sup>	26.4 (25.7, 27.2)
Fair	10.5 (9.5, 11.5)	20.0 (18.7, 21.4) <sup>b</sup>	9.0 (8.2, 9.9)
Poor	2.3 (2.1, 2.7)	5.9 (5.2, 6.5) <sup>b</sup>	1.8 (1.6, 2.0)
Medicare HCC score			
1st quartile (the healthiest group)	28.0 (26.7, 29.3)	24.7 (23.3, 26.1) <sup>b</sup>	28.5 (27.2, 29.8)
2nd quartile	22.0 (21.7, 22.4)	19.5 (18.9, 20.2) <sup>b</sup>	22.4 (22.1, 22.7)
3rd quartile	25.0 (24.5, 25.5)	24.9 (24.3, 25.6)	25.0 (24.5, 25.5)
4th quartile	25.0 (24.0, 26.1)	30.9 (29.7, 32.1) <sup>b</sup>	24.1 (23.1, 25.1)
Smoking status			
Never	89.0 (88.1, 89.9)	80.7 (79.0, 82.3) <sup>b</sup>	90.3 (89.6, 91.0)
Some/all days	11.0 (10.1, 11.9)	19.3 (17.7, 21.0) <sup>b</sup>	9.7 (9.0, 10.4)
Have a personal physician	94.8 (94.4, 95.2)	94.1 (93.5, 94.7)	94.9 (94.5, 95.4)
Number of routine care visits in last 6 months			
0	13.1 (12.6, 13.6)	9.8 (9.1, 10.4) <sup>b</sup>	13.6 (13.1, 14.2)
1-2	40.4 (39.6, 41.2)	31.9 (30.8, 33.1) <sup>b</sup>	41.7 (41.0, 42.5)
3+	46.5 (45.5, 47.4)	58.3 (57.2, 59.5) <sup>b</sup>	44.7 (43.7, 45.6)
Respondent rating of personal physician <sup>c</sup>			
0-4	1.4 (1.4, 1.5)	3.0 (2.8, 3.3) <sup>b</sup>	1.2 (1.1, 1.3)
5	2.1 (2.0, 2.2)	3.6 (3.3, 3.9) <sup>b</sup>	1.9 (1.8, 2.0)
6-7	5.9 (5.7, 6.0)	7.6 (7.2, 8.1) <sup>b</sup>	5.6 (5.4, 5.8)
8-9	28.5 (27.9, 29.1)	27.6 (26.6, 28.6)	28.6 (28.0, 29.2)
10	43.6 (42.8, 44.4)	42.9 (41.7, 44.0)	43.7 (42.8, 44.6)
No visits	18.5 (17.8, 19.2)	15.3 (14.5, 16.2) <sup>b</sup>	19.0 (18.3, 19.7)
Received flu shot last influenza season			
	71.6 (70.2, 72.9)	64.2 (62.1, 66.2) <sup>b</sup>	72.7 (71.5, 73.9)

<sup>a</sup>All results are weighted percentages and 95% confidence intervals. Percentages may not sum to 100 due to rounding.

<sup>b</sup>Values indicate statistical difference by Hispanic ethnicity at  $p < .05$  level.

<sup>c</sup>Ratings were applicable to respondents who reported one or more visits to a personal physician in the last 6 months. Rating scale 0-10: 0=worst personal doctor possible; 10=best personal doctor possible.

LIS = Part D Low-Income Subsidy

ADL = Activities of daily living

HCC = Hierarchical Condition Category

Disability Follow-Back Survey, Hispanics were less likely to have reported CRN than Whites.<sup>74</sup> One possible explanation of this discordance is that these investigators did not describe how they defined the terms *Hispanic*, *Black*, and *White*; the definitions used may have contributed to their finding. Other explanations might be that their study used data from 1994–1995, or that their study was restricted to disabled individuals, while our study was more recent and was not restricted to disabled individuals.

Soumerai et al. reported unadjusted prevalence of CRN among Hispanic respondents, which was not statistically significantly different from the prevalence of CRN among White respondents to the Fall 2004 MCBS.<sup>70</sup> Their multivariate model, while adjusting for several confounders, did not include Hispanic ethnicity.

Gellad and colleagues,<sup>83</sup> using data from a 2003 national survey of persons 65 years and older, found significant disparity in CRN for Hispanics and Blacks compared with Whites until income was added to their model, at which point the racial/ethnic disparity in CRN was no longer statistically significant. In contrast, we found that disparity in reported CRN for Hispanics and certain minority racial groups remained significant, although reduced, after controlling for both SES quartile and prescription medication insurance coverage. This may be attributable to the way in which SES was measured in our study. In addition, the Gellad et al. study did not include APIs and AIANs, and it is not clear how respondents were categorized as Hispanic, Black, or White in that study.

Acculturation is a sociological factor that can affect the health behaviors of Hispanics. The Hispanic ethnic group has high levels of immigration; in 2000, 40% of individuals in this group were foreign-born.<sup>92</sup> In the general population, age at migration, country of origin, nativity, and length of residence in the U.S. have all been shown to be associated with having health insurance,<sup>20, 21,23,28,35</sup> access to health care,<sup>20, 21,27,30,33-34</sup> health behaviors,<sup>93</sup> and health outcomes<sup>11,14,29-33,54,94-97</sup> in the general population. Less acculturated individuals may have difficulty accessing and navigating the health care system, and may be relegated to lower-paying jobs or part-time work, positions that often do not provide health insurance coverage. Some of these associations are not germane to our study population, as Medicare enrollees are more homogeneous in terms of health insurance than is the case in the general population and most of the respondents no longer work. For these reasons, CRN among Hispanics in the general population may be higher than the rate we found in our study of Medicare beneficiaries. Acculturation, income, access, and health behaviors are important factors to consider in planning/ implementing any intervention to help reduce CRN for the Hispanic group.

Religious affiliations,<sup>9,13-14</sup> family and friendship ties,<sup>9,14,32</sup> and neighborhood environments<sup>9, 10,12</sup> are types of social support networks that have been shown to be associated with improved access to care and health outcomes in the Hispanic group. These ties may mitigate the deleterious effects of potential sociological mechanisms, such as poverty and lack of education/opportunities,<sup>2,7,8-11</sup> which we found in our study to be associated with CRN. Perhaps individuals with strong social support networks would receive encouragement and support for healthy behaviors, and thus be less likely to engage in CRN. Consideration could be given to incorporating social support networks as part of any intervention geared to decreasing CRN in this population.

Conceptually, it is clear that CRN is affected by drug insurance. As might be expected,

**Table 3.****ODDS RATIOS (OR) FROM CRUDE AND ADJUSTED LOGISTIC REGRESSION PREDICTING COST RELATED NONADHERENCE OF PRESCRIPTION DRUGS AMONG MEDICARE CAHPS SURVEY RESPONDENTS IN SPRING 2007**

	Crude OR (95% CI)	Total Adjusted OR (95% CI)	Hispanics AOR (95%)	Non-Hispanics AOR (95% CI)
Hispanic ethnicity				
Yes	1.71 (1.54, 1.90)	1.19 (1.08, 1.31)		
No (Reference)	1.00	1.00		
Race				
Black	2.06 (1.92, 2.20)	1.39 (1.27, 1.51)	1.14 <sup>a</sup> (0.71, 1.83) <sup>a</sup>	1.40 (1.29, 1.53)
Asian/Pacific Islander	0.75 (0.61, 0.93)	0.90 <sup>a</sup> (0.73, 1.10) <sup>a</sup>	1.22 <sup>a</sup> (0.64, 2.33) <sup>a</sup>	0.87 <sup>a</sup> (0.69, 1.10) <sup>a</sup>
American Indian/Alaska Native	2.59 (2.17, 3.10)	1.49 (1.16, 1.90)	1.24 <sup>a</sup> (0.74, 2.07) <sup>a</sup>	1.65 (1.29, 2.12)
Multi-race	2.15 (1.96, 2.36)	1.63 (1.44, 1.85)	1.78 (1.13, 2.80)	1.62 (1.44, 1.83)
Race not reported	1.88 (1.66, 2.13)	1.28 (1.04, 1.58)	1.31 (1.06, 1.62)	1.30 <sup>a</sup> (0.99, 1.72) <sup>a</sup>
White (Reference)	1.00	1.00	1.00	1.00
Sex				
Female	1.33 (1.29, 1.37)	1.36 (1.31, 1.42)	1.39 (1.17, 1.65)	1.35 (1.28, 1.41)
Male (Reference)	1.00	1.00	1.00	1.00
Age				
18-44	4.29 (3.88, 4.74)	2.99 (2.73, 3.27)	2.15 (1.62, 2.85)	3.06 (2.79, 3.37)
45-64	3.87 (3.62, 4.14)	2.29 (2.12, 2.46)	1.74 (1.37, 2.21)	2.33 (2.16, 2.51)
75-80	0.81 (0.78, 0.84)	0.73 (0.69, 0.77)	0.77 (0.63, 0.93)	0.73 (0.69, 0.77)
>80	0.61 (0.58, 0.64)	0.45 (0.42, 0.48)	0.43 (0.31, 0.59)	0.44 (0.40, 0.47)
65-74 (Reference)	1.00	1.00	1.00	1.00

*(Continued on p. 531)*

**Table 3. (continued)**

	Crude OR (95% CI)	Total Adjusted OR (95% CI)	Hispanics AOR (95%)	Non-Hispanics AOR (95% CI)
Education				
< high school diploma	1.58 (1.46, 1.72)	1.23 (1.15, 1.31)	1.42 (1.20, 1.68)	1.22 (1.15, 1.30)
≥ high school diploma (Reference)	1.00	1.00	1.00	1.00
Rural residence				
Yes	1.16 (1.07, 1.25)	1.02 <sup>a</sup> (0.97, 1.08) <sup>a</sup>	1.15 <sup>a</sup> (0.83, 1.59) <sup>a</sup>	1.02 <sup>a</sup> (0.96, 1.08) <sup>a</sup>
No (Reference)	1.00	1.00	1.00	1.00
Socioeconomic status score				
4th quartile	1.41 (1.31, 1.53)	1.16 (1.09, 1.24)	1.01 <sup>a</sup> (0.73, 1.40) <sup>a</sup>	1.16 (1.09, 1.24)
3rd quartile	1.80 (1.64, 1.96)	1.30 (1.22, 1.39)	1.22 <sup>a</sup> (0.92, 1.61) <sup>a</sup>	1.30 (1.22, 1.39)
2nd quartile	2.32 (2.11, 2.56)	1.37 (1.28, 1.47)	1.27 <sup>a</sup> (0.95, 1.71) <sup>a</sup>	1.38 (1.28, 1.48)
1st quartile (Reference: the least affluent group)	1.00	1.00	1.00	1.00
Drug coverage				
Part D, deemed LIS	2.24 (1.97, 2.54)	0.77 (0.69, 0.86)	0.54 (0.41, 0.70)	0.77 (0.69, 0.87)
Part D, non-LIS & non-deemed LIS	1.41 (1.22, 1.61)	1.43 (1.30, 1.58)	0.98 <sup>a</sup> (0.77, 1.24) <sup>a</sup>	1.44 (1.30, 1.59)
Other creditable drug benefit	0.75 (0.68, 0.84)	0.71 (0.64, 0.79)	0.75 <sup>a</sup> (0.55, 1.02) <sup>a</sup>	0.71 (0.63, 0.79)
No known drug coverage (Reference)	1.00	1.00	1.00	1.00
ADI disability score				
3-6	3.67 (3.48, 3.88)	1.83 (1.72, 1.95)	1.75 (1.40, 2.20)	1.80 (1.69, 1.91)
1-2	2.36 (2.26, 2.47)	1.53 (1.46, 1.60)	1.54 (1.22, 1.96)	1.52 (1.45, 1.60)
0 (Reference)	1.00	1.00	1.00	1.00

(Continued on p. 532)

**Table 3. (continued)**

	Crude OR (95% CI)	Total Adjusted OR (95% CI)	Hispanics AOR (95%)	Non-Hispanics AOR (95% CI)
General health status				
Excellent	0.47 (0.43, 0.51)	0.62 (0.56, 0.68)	0.75 <sup>a</sup> (0.50, 1.13) <sup>a</sup>	0.61 (0.55, 0.68)
Very good	0.58 (0.54, 0.62)	0.74 (0.68, 0.80)	0.63 (0.48, 0.82)	0.75 (0.69, 0.81)
Fair	1.90 (1.80, 2.02)	1.19 (1.12, 1.28)	1.18 <sup>a</sup> (0.91, 1.52) <sup>a</sup>	1.20 (1.13, 1.28)
Poor	3.30 (3.08, 3.54)	1.42 (1.30, 1.56)	1.43 (1.04, 1.98)	1.43 (1.30, 1.58)
Good (Reference)	1.00	1.00	1.00	1.00
Mental health status				
Excellent	0.55 (0.52, 0.58)	0.90 (0.84, 0.97)	1.03 <sup>a</sup> (0.83, 1.27) <sup>a</sup>	0.90 (0.84, 0.97)
Very good	0.68 (0.65, 0.72)	0.97 <sup>a</sup> (0.91, 1.04) <sup>a</sup>	1.24 (1.01, 1.52)	0.95 <sup>a</sup> (0.90, 1.01) <sup>a</sup>
Fair	1.96 (1.85, 2.07)	1.20 (1.12, 1.29)	1.53 (1.27, 1.85)	1.17 (1.09, 1.26)
Poor	2.86 (2.56, 3.19)	1.42 (1.25, 1.61)	1.38 <sup>a</sup> (0.94, 2.01) <sup>a</sup>	1.35 (1.18, 1.53)
Good (Reference)	1.00	1.00	1.00	1.00
Medicare HCC score				
4th quartile	1.49 (1.41, 1.58)	1.32 (1.22, 1.42)	1.30 <sup>a</sup> (0.99, 1.70) <sup>a</sup>	1.31 (1.20, 1.43)
3rd quartile	1.17 (1.11, 1.23)	1.19 (1.12, 1.25)	1.26 <sup>a</sup> (0.95, 1.67) <sup>a</sup>	1.18 (1.10, 1.25)
2nd quartile	1.02 <sup>a</sup> (0.97, 1.07) <sup>a</sup>	1.14 (1.09, 1.21)	1.13 <sup>a</sup> (0.84, 1.53) <sup>a</sup>	1.15 (1.08, 1.22)
1st quartile (Reference: the healthiest group)	1.00	1.00	1.00	1.00
Smoking status				
Yes	2.23 (2.11, 2.36)	1.28 (1.21, 1.35)	1.26 <sup>a</sup> (0.97, 1.64) <sup>a</sup>	1.29 (1.21, 1.37)
No (Reference)	1.00	1.00	1.00	1.00
Have a personal physician				
No	1.17 (1.09, 1.27)	1.25 (1.12, 1.39)	1.32 <sup>a</sup> (0.94, 1.86) <sup>a</sup>	1.21 (1.07, 1.38)
Yes (Reference)	1.00	1.00	1.00	1.00

(Continued on p. 533)

**Table 3. (continued)**

	Crude OR (95% CI)	Total Adjusted OR (95% CI)	Hispanics AOR (95%)	Non-Hispanics AOR (95% CI)
Number of routine care visits in last 6 months				
3 or more	1.83 (1.71, 1.95)	1.27 (1.18, 1.38)	1.34 (1.03, 1.76)	1.29 (1.20, 1.39)
1-2	1.07 <sup>a</sup> (1.00, 1.15) <sup>a</sup>	1.02 (0.94, 1.10)	0.98 <sup>a</sup> (0.75, 1.27) <sup>a</sup>	1.04 <sup>a</sup> (0.96, 1.13) <sup>a</sup>
None (Reference)	1.00	1.00	1.00	1.00
Respondent rating of physician				
0-4	2.59 (2.34, 2.87)	2.02 (1.78, 2.28)	1.74 (0.86, 3.54)	2.04 (1.80, 2.32)
5	1.94 (1.75, 2.15)	1.84 (1.60, 2.11)	1.85 (1.30, 2.62)	1.81 (1.58, 2.08)
6-7	1.39 (1.30, 1.49)	1.34 (1.24, 1.46)	1.79 (1.33, 2.41)	1.29 (1.18, 1.41)
8-9	0.98 <sup>a</sup> (0.93, 1.04) <sup>a</sup>	1.09 (1.03, 1.15)	1.04 <sup>a</sup> (0.85, 1.27) <sup>a</sup>	1.08 (1.02, 1.15)
No visits	0.82 (0.78, 0.87)	0.91 (0.83, 0.99)	0.91 <sup>a</sup> (0.66, 1.25) <sup>a</sup>	0.92 <sup>a</sup> (0.83, 1.01) <sup>a</sup>
10 (Reference: the most favorable group)	1.00	1.00	1.00	1.00
Received flu shot last influenza season				
No	1.49 (1.42, 1.56)	1.17 (1.11, 1.23)	1.09 <sup>a</sup> (0.90, 1.32) <sup>a</sup>	1.18 (1.11, 1.25)
Yes (Reference)	1.00	1.00	1.00	1.00

<sup>a</sup>Values are not statistically significant at  $p < .05$ .

CI = confidence interval

ADL = Activities of daily living

HCC = Hierarchical Condition Category



we found that respondents with drug coverage were less likely to report CRN than those without. The exception to this is that respondents with "Part D coverage, non-LIS" were more likely to report CRN than the "No known drug coverage" group. One possible explanation of this finding is that enrollees who responded in the Spring of 2007 may have been recalling their experience in the 2006 coverage gap (commonly known as the "doughnut hole") of the standard Part D benefit, when they were liable for the complete cost of the prescription, or during the first part of 2007 before they had reached the Part D deductible limit. Other investigators have found that Medicare beneficiaries reduced their drug use after reaching the coverage gap<sup>98-99</sup> and CRN could very well have been a significant factor in that reduction. Another possible explanation for this finding is that there may be an adverse selection bias in Part D enrollment where relatively healthier enrollees with limited or no prescription drug needs elected not to enroll in a Part D plan, making the "No known drug coverage" group appear on average more adherent with their prescription drug regimen. Finally, some of the individuals in the "No known drug coverage" group may actually have Medigap or other prescription insurance that may not be Part D-equivalent but was nonetheless adequate to cover the individual's medication needs, thus reducing CRN; not all creditable drug coverage was thoroughly identified in the early years of Part D.

Our finding of greater CRN with increased disease burdens (i.e., self-reported general and mental health, ADL disability scores, and HCC risk scores) and poor health habits (i.e., smoking) is consistent with the findings of other investigators.<sup>59,65,69 75,78,79,81</sup> This finding may be partially explained by a greater use of medications and higher out-of-pocket expenses for persons in poor health or individuals with multiple comorbidities.<sup>65,69-71,73 75,77-78,100 101</sup> We found that the significant association of poorer health with CRN was independently significant across all health status measures we examined.

Our finding that respondents who gave their personal physician a higher rating were less likely to report CRN is consistent with findings from others.<sup>102-103</sup> There is evidence that patients would like their physicians to discuss prescription medication costs and cost-reduction strategies with them, but that this type of information exchange occurs infrequently.<sup>104-106</sup> Additional potential patient-provider issues that may affect persons of Hispanic ethnicity are the cultural competency and language skills of the provider. Several investigators have found less patient satisfaction with information exchange and care, less adherence, and poorer health outcomes when language barriers exist or if patients perceive a lack of provider cultural competence.<sup>41,42,107 117</sup> It is possible that, at least for some Hispanic respondents, these issues played a contributing role in self-reported CRN.

**Limitations and strengths.** There are limitations to this study. It had a cross-sectional design, thus no causal inferences may be made. Our survey response rate was moderate at 48%. Males and those younger than 65 years old were more likely to be non-responders. Survey response rates have been monitored among survey methodologists and appear to have been declining in recent years.<sup>118</sup> The underlying concern is that even with a probability sampling design, a low response rate could result in biased and less generalizable inferences, especially when the non-response occurs differentially across subpopulations. Our finding of males being more likely to be non-responders is consistent with previous studies.<sup>119-124</sup> The higher non-response rates among younger

individuals in our study is also consistent with other study findings.<sup>120,122,124</sup> However, in our opinion, these differential response rates are only relevant to the issue of selection bias if their impact on CRN is differential, an effect that unfortunately cannot be measured because, inherent to survey research, we were unable to capture dependent variable information for non-responders. In our adjusted model, we found the younger age group more likely than the 65–74 year old reference group to report CRN (AOR=2.99; 95% CI=2.73, 3.27). Additional study findings have suggested that non-responders may be less satisfied with their health care,<sup>125–126</sup> and that satisfaction with medical care was predictive of CRN;<sup>102–103</sup> thus, we may have underestimated the risk of CRN in our study. Post-survey re-weighting of responses can mitigate this to some extent, but this re-weighting is done only on a set of sample frame dimensions that may or may not be related to CRN. However, to the extent that survey non-response is correlated with the control variables and covariates we include in our model, the model produces generalizable results with respect to CRN. It is only if unobserved attributes are significantly correlated with both survey non-response and CRN that the model produces distorted results. Unfortunately, we cannot determine whether such factors exist, nor, if they do exist, the extent to which they might distort the results.

We estimated CRN utilizing a single question on the CAHPS questionnaire that addressed only one facet of CRN. As there are different types of intentional non-adherence to prescription medications, with several cost-reduction strategies and behaviors, we are likely understating the overall CRN of Medicare enrollees. Self-reported CRN could not be confirmed with the use of these administrative data, but moderate-to-high concordance has been found for self-reported compared with other *non-self-reported* measures of medication adherence.<sup>127</sup> Self-reporting is subject to potential recall bias and social desirability bias: respondents may not accurately remember events in the past<sup>128–129</sup> or may be reluctant to admit not being adherent to a medication regimen, especially if this is due to cost or financial factors.<sup>130–131</sup> Both of these biases may contribute to an underestimation of the overall prevalence of CRN in this population.

We did not have information on age at migration, country of origin, nativity, and length of residence in the U.S. as measures of acculturation; thus, we were unable to examine the association of acculturation with CRN with available data. We also did not have information on other potential sociological mechanisms such as religious affiliations, family and friendship ties, and neighborhood environments, which have been shown to be associated with health behaviors and outcomes, so could not examine the association of these factors with CRN.

Data from the CAHPS questionnaire do not include plan-specific details about the generosity of the drug benefit, a factor that has been shown to influence prescription drug use.<sup>132</sup> Although we did not have an income variable from the CAHPS survey, we retrieved the 2000 U.S. Census data for the computation of a widely accepted proxy income indicator. Both the proxy income indicator and the LIS status obtained from the CMS administrative data files provided proxies for income status that have been shown to be attributable to CRN, but they are proxies for actual income, which was unavailable.

Our study has several unique strengths. It is contemporary, with information

describing the 2006 experience of Medicare enrollees. Both ethnicity and race were self-reported, which is the gold standard for this type of research. We brought in HCC risk scores to augment the health status risk factors used in our adjusted regression models. Although the exact wording of the CRN question from the CAHPS has not been validated, a test-retest reliability study of very similar questions showed a kappa statistic ranging from 0.6–0.9, with McNemar's test statistics showing no statistically significant differences in measures reported at two points in time.<sup>133</sup>

## Conclusions

In summary, we found that Hispanic Medicare enrollees were more likely than non-Hispanic Medicare enrollees to report CRN. Other than financial pressure, CRN for an individual may be influenced by factors such as patient or provider characteristics, patient-provider communication, health system factors, and the complexity of an individual's prescription drug regimen.<sup>134</sup> Factors affecting health behaviors, access to health care, and health outcomes that are particularly relevant for the Hispanic minority group are levels of acculturation, language barriers, and other cultural norms, each of which must be recognized and addressed with culturally tailored interventions. More research is needed to understand what interventions or improvements would help to reduce CRN in this minority population.

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