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MEDICARE HEALTH OUTCOMES SURVEY

**Disparities in Medicare Beneficiary Outcomes:
Socio-Demographic Vulnerability and Prevalent Problems
in Older Populations**

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1.0 EXECUTIVE SUMMARY

Despite widespread efforts to reduce disparities in the Medicare managed care program, studies^{1-2,7,9} indicate that vulnerable Medicare managed care subgroups, such as racial/ethnic minorities or low socioeconomic populations, continue to disproportionately experience quality of care problems. Strategies to reduce disparities have generally emphasized the importance of improving preventive services, yet the relationship between vulnerability and the receipt of preventive services in Medicare managed care is not well-understood.

This report assesses the extent to which receipt of recommended preventive services varies by vulnerability status. While past studies examined the influence of important risk factors in the use of health services, few examined vulnerability as a combination of multiple risk factors, despite the fact that the convergence of risks best reflects reality. This study defines and operationalizes a concept of vulnerability based on the Aday/Anderson access to care framework by using a combination of multiple risk factors that include race/ethnicity, education level, and health status.

Data are from the 2006 Medicare Health Outcomes Survey (HOS), a mail survey with telephone follow-up of a nationally representative sample of Medicare managed care (i.e., Medicare Advantage) members. The HOS assessed whether elderly members reported receipt of seven recommended preventive counseling and care services for prevalent conditions among older adults: discussion of urinary incontinence with a doctor/provider; receipt of urinary incontinence treatment; discussion of physical activity with a doctor/provider; advice from a doctor/provider

on starting, maintaining or increasing levels of physical activity; discussion of fall risk with a doctor/provider; receipt of fall risk management; and osteoporosis testing in older women.

Hierarchical multivariable logistic regression was used to model receipt of these preventive services as a function of vulnerability status (as defined by a combination of race/ethnicity, education, and health status factors). The unit of analysis was the individual, but hierarchical modeling was used to account for clustering of individuals within health plans.

Controlling for other factors, results indicate that odds of receiving recommended services generally increased as the number of risk factors increased. Being a racial/ethnic minority, having low education, or being in poor health were significant predictors of receiving services. A combination of two factors was a better predictor, and having all three risk factors was often the best predictor. Certain combinations of factors had an especially pronounced effect, such as the combination of low education and poor health in increasing odds of receiving services relevant to urinary incontinence and physical activity. The exception was osteoporosis testing in older women, with non-Hispanic Whites reporting higher odds of receiving testing than non-Hispanic Blacks, regardless of education or health status. Overall, however, there were shortfalls in receipt of preventive services across all areas of care, with no more than 70% of respondents reporting receipt for any given service.

These findings suggest that there have been improvements in reducing disparities in receipt of preventive services among vulnerable Medicare managed care members. The observed exception with osteoporosis testing may have been clinically-driven, since Whites having significantly higher risk for osteoporosis than Blacks. However, overall shortfalls in receipt of

any preventive service persist. Examining vulnerability as a combination of risk factors enhances our ability to target and meet the specific the needs of important vulnerable subgroups, as well as efforts to improve care overall for the elderly population.

2.0 INTRODUCTION

Elderly Medicare beneficiaries often experience conditions that affect functioning and increase future risk of hospitalizations, institutionalization in nursing homes, morbidity and mortality. However, many traditionally vulnerable subgroups, including low-income beneficiaries, females, and/or racial and ethnic minorities, experience disproportionately higher rates of health problems in general, such as higher mortality and morbidity.^{1,2} The elimination of these differences, termed health disparities, is a priority in the medical and public health community, and efforts to reduce disparities have emphasized the improvement of preventive services to disadvantaged, vulnerable populations.^{3,4} Despite this, the general use of preventive services is low among Medicare beneficiaries. A Government Accountability Office report in 2004 found Medicare beneficiaries were unlikely to receive recommended preventive care services and one third had high lipid levels, but were not told by their doctor.⁵ Furthermore, disparities in Medicare managed care are not well-understood, and gaps in receipt of recommended preventive services (e.g., mammograms, flu shots, cholesterol screenings) persist among vulnerable subgroups in the general Medicare population, including racial/ethnic minorities^{6,7,8,9}, and low income or low education individuals.^{10,11,12}

This study attempts to examine one of the most important issues in Medicare: how well the most vulnerable elderly subgroups in Medicare are faring in managed care plans. These vulnerable subgroups often have the most health problems and the least means to pay for their care, making them the least attractive customers for health plans. Yet, paradoxically, these subgroups would find health plans to be an appealing option because of the potential for out-of-pocket savings and

coordination of care. This study examines disparities in receipt of preventive services among Medicare managed care members by defining and operationalizing a concept of vulnerability.

The vulnerability concept was adapted from the access to care framework developed by Anderson and Aday, which characterized three risk factors with respect to likelihood of poor access and health-related outcomes: predisposing characteristics, which contribute to an individuals' propensity to use health services (e.g., age, race/ethnicity); enabling characteristics, which are the means individuals have available for use of services (e.g., income, education, insurance coverage); and need characteristics such as health status or illness, which are the most important cause of health service use.¹³ In research, the Aday/Anderson ideas have been translated so that the concept of vulnerability has been operationalized as a combination of multiple risk factors associated with access to care: predisposing, enabling, and need factors. Operationalizing vulnerability as a combination of multiple risks is preferred over examining disparate risk factors separately, since vulnerability as convergence of risks better captures reality.¹⁴ The resulting vulnerability status or risk profiles have been used to assess vulnerability as it relates to health services use and other outcomes.^{6,9,15,16} Most studies have provided evidence of a "dose-response" relationship between vulnerability status and outcomes of interest. For example, greater vulnerability status (e.g., having more risk factors or having certain risk factors relative to no risk factors) was associated with lack of health insurance coverage,¹⁷ not receiving recommended preventive services (mammograms, flu shots, cholesterol screenings),⁶ and poor ratings of patient-provider relationships.¹⁴

The Medicare managed care population is of special interest for several reasons. First, it includes a broad cross-section of the elderly population, including women, racial/ethnic minorities, and those with low-income or education. Second, since managed care plans may offer greater coordination of care and lower out-of-pocket costs than traditional Medicare, they have been, and are likely to remain, an attractive option for vulnerable beneficiaries, such as those with limited income, or those who have chronic conditions.

We focus our analysis on a set of quality of care measures that assess different facets of preventive services in Medicare managed care plans using patient-reported data from the Medicare Health Outcomes Survey (HOS), a nationally representative survey of Medicare managed care members overseen by the National Committee for Quality Assurance (NCQA) on behalf of the Centers for Medicare & Medicaid Services (CMS).¹⁸ The measures address whether eligible beneficiaries receive preventive services recommended by the United States Preventive Services Task Force (USPSTF) and other professional organizations for four prevalent problems that affect functioning and quality of life in older populations: urinary incontinence, physical activity, fall risk and osteoporosis.

Using a concept of vulnerability operationalized through a combination of multiple risk factors, we examine the relationship between the receipt of recommended preventive services and vulnerability status. The risk factors included in this study are being a racial/ethnic minority, low education, and poor health status.

The specific research aims of this analysis are to:

1. Define and operationalize vulnerability status in a cohort of elderly Medicare managed care members, based on race/ethnicity, education level, and health status
2. Characterize the extent to which elderly Medicare managed care members report receipt of seven recommended preventive counseling or care services for urinary incontinence, physical activity, fall risk or osteoporosis:
 - a. Urinary incontinence
 - i. Whether members discussed urinary incontinence problems with a doctor or provider
 - ii. Whether members received treatment for urinary incontinence problems
 - b. Physical activity:
 - i. Whether members discussed physical activity with their doctor or provider
 - ii. Whether doctors advised members on starting, maintaining or increasing levels of physical activity
 - c. Fall risk:
 - i. Whether members discussed falls or balance problems (fall risk) with their doctor or provider
 - ii. Whether members received fall risk management from their doctor or provider
 - d. Osteoporosis testing in older women:
 - i. Whether female members ever received a bone density test for osteoporosis; and
3. Evaluate the relationship between vulnerability status and receipt of preventive services for urinary incontinence, physical activity, fall risk, and osteoporosis testing in elderly Medicare managed care enrollees.

3.0 METHODS

3.1 Data and Study Sample

Data for this analysis are from the 2006 Medicare Health Outcomes Survey (HOS) version 2.0, a mail survey with telephone follow-up.¹⁹ The HOS version 2.0 is a health survey instrument developed to analyze the impact of Medicare health plans on members' self-reported health status using the Veterans RAND-12 (VR-12) questionnaire. Importantly, the HOS also contains additional questions that make it possible to learn whether elderly enrollees are receiving recommended preventive services across four health areas important to the elderly population: urinary incontinence, physical activity, fall risk, and osteoporosis.

In 2006, the HOS included for the first time, a full set of seven newly or recently-introduced quality of care measures that assessed different facets of preventive counseling and care across all these problem areas.²⁰ Specifically, these seven measures assessed whether a Medicare managed care member: (1) discussed urinary incontinence problems with their doctor/provider; (2) received urinary incontinence treatment; (3) discussed physical activity with their doctor/provider, (4) was advised to start, increase or maintain levels of physical activity by their doctor/provider; (5) discussed fall or balance problems (fall risk) with their doctor/provider; (6) received fall risk management from their doctor/provider; and (7) ever had a bone density test to check for osteoporosis (for older women only).

Because the HOS is intended to be longitudinal, a baseline survey is administered to a cohort of HOS respondents in a given year, and the same survey is re-administered 2 years later to the

same Medicare managed care plan members if they were still enrolled in the same plan. Thus, in any given calendar year, survey data are collected from two cohorts of HOS respondents, a cohort completing their follow-up survey that year (and thus completing the entire HOS cycle), and a cohort completing their baseline survey that year (and thus embarking on the HOS cycle). Data from the 2006 HOS thus include baseline survey data from Cohort 9 of the HOS and follow-up survey data from Cohort 7 of the HOS. Since data for the full new set of measures were collected for the first time in 2006, the data for these measures encompass two cohorts: baseline data from Cohort 9, and follow-up data from Cohort 7.

A preliminary analysis comparing each of these cohorts indicated that there were few health-related or demographic differences between them. Collected from a nationally representative sample of individuals randomly selected for the survey, we used a single master file of 2006 HOS data, assembled by combining baseline survey data from Cohort 9 and follow-up survey data from Cohort 7 (n=253,666). Using the combined cohorts had the advantage of increasing the sample size available for the analysis, providing greater statistical power. The 2006 HOS Cohort 9 baseline overall response rate was 64.2%; the 2006 Cohort 7 follow-up overall response rate was 80.2%. The total number of health plans was 203.

This analysis focused on eligible community-dwelling, elderly Medicare Advantage (MA) members age 65 years and over who returned a usable baseline or follow-up English-language

survey in 2006 (at least 80% of survey completed), and who were not proxy¹ respondents. Individuals were excluded from this analysis if they were selected for sampling but were ineligible (deceased, not in a managed care organization, had end-stage renal disease, had a language barrier, or had incorrect telephone or address information). Of the eligible population who responded (returned a survey with at least 80% complete), we excluded individuals who were not elderly (under age 65 years); were institutionalized; used proxy respondents (because of the potentially important health status differences between them and the rest of the population); completed a non-English language HOS (communication is a core component for most of the quality of care measures, particularly those that assess whether a type of patient-physician discussion occurred, and there may have been profound differences in communication styles or abilities between those who are not conversant in English compared to those who are); or indicated that they did not want to be included in the list of surveyed individuals. Also excluded from the analysis were individuals who had missing values on the key independent variable of vulnerability status (this variable is described in greater detail below in Section 3.2.). The overall study sample of individuals eligible for study analysis was 110,238 community-dwelling elderly from 199 MA plans.

These 110,238 individuals were then subjected to additional inclusion and exclusion criteria for inclusion in assessment for each of the seven Effectiveness of Care measures (each measure's inclusion/exclusion criteria are described in greater detail below in Section 3.3). These selection criteria resulted in final sample sizes of 29,534 (discussing urinary incontinence); 29,424

¹ In the HOS protocol, if a sample beneficiary is unable to respond to the survey, a friend or family member familiar with the beneficiary's health status and care may respond on their behalf, and is referred to as the "proxy."

(receiving urinary incontinence treatment); 102,215 (discussing physical activity; 103,643 (advising physical activity); 69,726 (discussing fall risk); 36,253 (managing fall risk); and 64,841 (osteoporosis testing in older women).

3.2 Independent Variable: Vulnerability Status

The main independent variable is vulnerability status (Tables 1 and 2). As previously described, it was defined and operationalized by adapting the access to care framework developed by Anderson and Aday, so that the concept of vulnerability has been operationalized as a combination of multiple risk factors associated with access to care: predisposing (e.g., age, race/ethnicity), enabling (e.g., income, education, health insurance), and need (e.g., health status or illness) factors.

For the purpose of this study, the measure of vulnerability was likewise operationalized by assembling a profile of multiple risk factors reflecting predisposing, enabling and need factors. Examining vulnerability as a combination of factors, rather than studying each factor separately, is preferable since, in reality, vulnerable individuals often experience a combination of these risk factors, not just one (i.e., individuals are not one day racial/ethnic minorities, another day with poor education, yet another day in poor health).^{9,16} The most vulnerable individuals experience a convergence of all three types of factors.

Variables in the HOS that reflect predisposing, enabling, and need factors were examined, and three self-reported variables were identified and combined into a new vulnerability status measure for use in this analysis: race/ethnicity (predisposing factor); education level (enabling

factor); and general self-rated health status (need factor), which is strongly linked to outcomes such as morbidity, mortality, and functional decline.^{9,21,22}

These factors were chosen not only because they dovetailed with the conceptualization of vulnerability based on Aday/Anderson, but because they had statistical and other advantages over other HOS variables that were considered, including: CMS race data (predisposing), income level (enabling), and VR-12 scores (need). First, for CMS race data, there is controversy regarding the use of administrative race/ethnicity data, which may be based on administrative observation or a clinical employees' observation (e.g., in a Veteran's Administration facility) and less accurate than individuals' self-reported race/ethnicity.^{23,24} While non-Hispanic Whites and non-Hispanic Black/African-American administrative race categorizations are regarded as generally accurate, there is substantial misreporting for other groups such as Native Americans, Asians, or Hispanic Whites.^{25,26} Thus, self-reported race/ethnicity was preferred. Second, for income level, there were too many missing values from the self-reported HOS data (almost 20% missing or 'don't know' responses) to include this variable.²⁷ Since education level is known to be closely correlated with income level, and since education level data from the HOS contained far fewer missing values (1.4% missing), it was the preferable variable. Finally, VR-12 scores are continuous variables expressed in progressive 1-point changes. While these changes in magnitude impart important information, the trade-off in using 1-point changes to categorize health status is that resulting subgroup sample sizes would be too small for comparative analysis and would not have enough power (VR-12 scores reach a maximum of 100 points), and the use of VR-12 scores would have forced the categorization of this continuous variable. However, categorizing a continuous variable introduces certain potential measurement error. Instead of

VR-12 scores, we thus use another health status variable that is already categorical by nature, the general self-rated health status item (responses of “Excellent”, “Very good,” “Good,” “Fair,” or “Poor” to the question “In general, would you say your health is?”). In addition, when we examined the relationship between general self-rated health status and VR-12 physical and mental component scores, we found that both variables were related in the expected direction (results not shown), that is poorer general self-rated health status corresponded with lower VR-12 health scores, indicating worse health. Because of its inherent advantages as a categorical variable, and its corresponding relationship with the VR-12, the general health status variable was preferred for use in the vulnerability status measure.

The three variables, self-reported race/ethnicity, education, and general health status, were next recoded into more limited categories to avoid small subgroup sample sizes. To assist in recoding, we performed preliminary analysis to examine distributions and ‘natural breakpoints’ in the data. We also balanced conceptual needs against sample size considerations in the recoding. Self-reported race/ethnicity was based on a combination of two variables in the HOS dataset, self-reported Hispanic ethnicity (Hispanic or non-Hispanic ethnicity) and self-reported race (American Indian/Alaskan Native, Asian, Black/African-American, Native Hawaiian/Pacific Islander, White, Another race). Self-reported race/ethnicity was recoded into non-Hispanic White and non-Hispanic Black; the remaining possible combined race/ethnicity categories (Hispanic, non-Hispanic American Indian/Alaskan Native, non-Hispanic Asian, non-Hispanic Native Hawaiian/Pacific Islander, non-Hispanic Another) were dropped since their small sub-sample sizes would not have held up to further division (once combined with other variables of education and general health status, individual cell samples for each of these

race/ethnicities would have been n=50 or less and have little statistical power). Also, from a conceptual perspective, it did not make sense to ‘lump’ these remaining race/ethnicity categories together – either with one another or with the separate category of non-Hispanic Blacks – since these racial/ethnic groups are different from one another. Self-reported education level was recoded into low education and high education. Low education referred to those whose highest level of education completed was high school/GED (but no college) or below. High education referred to those whose highest level of education completed was some college/2 year degree or above. General self-rated health status was recoded into poor health and good health. Poor health referred to those whose self-rated health was “fair” or “poor.” Good health referred to those whose self-rated health was “excellent”, “very good” or “good”.

While it was possible to create a vulnerability status measure that incorporated more information and variable categories, for example, using every available category of self-reported race/ethnicity, or using more than two categories for any of the three variables, the trade off would have been that some sample sizes would be too small for comparative analysis.

Individuals were subject to both the study’s overall exclusion/inclusion criteria, as well as unique exclusion/inclusion criteria specific to assessing each type of preventive service. For example, to be assessed for receipt of fall risk management, individuals needed to have had a visit with a doctor or other provider in the past 12 months *and* have had fall or balance problems in the past 12 months. Because of these constraints, there would not have been enough sample size in some subgroups if the vulnerability status measure incorporated more categories of each variable. The final vulnerability status measure, representing convergence of predisposing, enabling and need factors, consisted of 8 categories:

- 1) Non-Hispanic White—high education—good health group (representing the least vulnerable group, with vulnerable attributes in none of the three factors)
- 2) Non-Hispanic Whites—high education—poor health group
- 3) Non-Hispanic Black—high education—good health group
- 4) Non-Hispanic Black—high education—poor health group
- 5) Non-Hispanic Whites—low education—good health group
- 6) Non-Hispanic Whites—low education—poor health group
- 7) Non-Hispanic Black—low education—good health group
- 8) Non-Hispanic Black—low education—poor health group (representing the most vulnerable group, with vulnerable attributes in all three of the factors).

Table 2 illustrates the different categories of the vulnerability status measure.

Although groups 1 (Non-Hispanic Whites—high education—good health) and 8 (Non-Hispanic Black—low education—poor health) represent individuals at opposite ends of the vulnerability continuum (either with no risk factors or with convergence of all three risk factors), the vulnerability status variable is intended to be categorical, rather than continuous, in nature. This is because the eight possible categories are not meant to be ordinal. While group 1 (Non-Hispanic Whites—high education—good health) represents individuals that can reasonably be regarded as “least vulnerable” and group 8 (Non-Hispanic Black—low education—poor health) represents individuals that can be regarded as “most vulnerable,” the relative degree of vulnerability is not so clear for the rest of the study population, and it would not be as appropriate to apply an ordinal frame to them. Doing so would imply, for example, that group 2

would be closer to group 1 (the least vulnerable group) than group 7, thus closer to being less vulnerable than not. However, this would also imply that being Non-Hispanic Whites reporting high education, but poor health (group 2) represents being ‘better off’ and less vulnerable than being Black reporting low education, but good health (group 7). While each additional risk factor may increase an individual’s vulnerability, this study’s intention was not to rank the importance of the various risk factors. Making such a decision would require a judgment call that is not appropriate and is beyond the scope of this analysis. The intention of this study is to examine how vulnerability status may affect receipt of recommended preventive services. As such, we are simply categorizing, not ordinally ranking, different possible groups of vulnerability that can occur.

3.3 Dependent Variables: Receipt of Preventive Services

The dependent variables used in this analysis are receipt of recommended preventive counseling or care services across four health areas (Table 3). There are seven relevant dependent variables in all, assessing whether an elderly Medicare managed care member reported receipt of the following preventive services:

- **Urinary Incontinence:** (1) discussing urinary incontinence; (2) receiving urinary incontinence treatment
- **Physical Activity:** (3) discussing physical activity; (4) advising physical activity
- **Fall Risk:** (5) discussing fall risk; (6) managing fall risk – whether a member received fall risk management (e.g., suggested use of a cane or walker, blood pressure check, suggested exercise or physical therapy program, and suggested vision or hearing test) from a doctor/provider

- **Osteoporosis Testing in Older Women:** (7) whether a female member ever received a bone density test to check for osteoporosis.

3.4 Covariates

Several covariates were used since they may be associated with individuals' propensity for or experience in receiving different facets of preventive services (Table 1). These covariates were age, gender, marital status, enrollment duration (in months), geographic census region, and survey indicator – whether an individual completed the Cohort 9 baseline or Cohort 7 follow-up HOS.

3.5 Statistical Analysis

All analyses were performed using SAS version 9.1. The unit of analysis was the individual Medicare Advantage (MA) member. First, bivariate analyses comparing vulnerability status and whether an individual received different facets of preventive services were examined using chi-square analysis. Then, seven multivariable logistic regression models estimated the receipt of each of the preventive services as a function of vulnerability status. Model 1 examined discussion of urinary incontinence as a function of vulnerability status. Model 2 examined receipt of urinary incontinence treatment as a function of vulnerability status. Model 3 examined discussion of physician activity as a function of vulnerability status. Model 4 examined advising physician activity as a function of vulnerability status. Model 5 examined discussing fall risk as a function of vulnerability status. Model 6 examined managing fall risk as a function of vulnerability status. Finally, Model 7 examined whether a female member ever received an osteoporosis test as a function of vulnerability status.

All equations were estimated using hierarchical logistic regression modeling to account for clustering of patients within plans, and controlled for the covariates of: age; gender (with the exception of the model for osteoporosis testing, since the outcomes only applied to women); marital status; enrollment duration; geographic census region; and survey indicator (whether the individual was in the HOS Cohort 9 baseline or Cohort 7 follow-up). Odds ratios and confidence intervals are presented.

To ensure minimal co-linearity, we examined the correlations among all independent variables used in the analysis (data not shown) and determined that they were either not correlated or had low correlation (below 0.3). Because we examined seven simultaneous outcomes from the same dataset of individual MA members, we also applied a Bonferroni correction to our interpretation of p-values. Thus, at the alpha testing level of 0.05, only p-values less than $0.05/7 = 0.007$ provided evidence of a vulnerability status effect in receipt of any given preventive service.

4.0 RESULTS

Table 4 displays the distribution of elderly Medicare managed care members, age 65 and over, by vulnerability status as the convergence of race/ethnicity, education level and self-rated health. Among the 110,238 individuals eligible for inclusion in the overall study sample, the majority: was Non-Hispanic White (93.5% of overall distribution); reported high education (59.9% overall distribution); and reported good health (76.1% overall distribution). While non-Hispanic Blacks comprised only 6.5% of the overall distribution, a higher proportion of non-Hispanic Blacks than non-Hispanic Whites reported low education (40.8% vs. 29.3%) and poor health (37.8% vs. 22.8%). More than one-third (40.7%) of the overall population fell into the least vulnerable group, the non-Hispanic White—high education—good health group. Less than one percent (0.5%) of the overall population fell into the non-Hispanic Black—low education—poor health group, the most vulnerable category.

Tables 5-8 present bivariate comparisons between vulnerability status and observed rates of receiving preventive services for urinary incontinence, physical activity, fall risk, and osteoporosis testing in older women.

Urinary Incontinence

Overall, only about one-half or less of respondents eligible for urinary incontinence measures (based on respondents' report of urinary incontinence symptoms) received preventive services for urinary incontinence (Table 5). Discussion activity was favored over actual treatment (54.9% discussing urinary incontinence vs. 35.3% receiving urinary incontinence treatment). The rate of

receipt of urinary incontinence services was generally higher for those of greater vulnerability status (having more risk factors), and lower for those with lower vulnerability (having fewer risk factors). The most vulnerable group, the non-Hispanic Black—low education—poor health group, reported the highest proportion of preventive services for urinary incontinence, relative to all other groups.

Physical Activity

Only about one-half or less of respondents received preventive services for physical activity (Table 6). Higher proportions reported discussing physical activity than being advised on it (52.2% vs. 45.1%). The Non-Hispanic Whites—low education—poor health group was most likely to discuss physical activity. The most vulnerable group, the Black—low education—poor health group, had the highest proportion of individuals receiving advice on physical activity. The rate of receipt of preventive services for physical activity was generally higher for those of greater vulnerability status (having more risk factors), and lower for those with lower vulnerability (having fewer risk factors).

Fall Risk

Overall, although, only about one-quarter (22.5%) of respondents discussed fall risks with their doctor, about one-half (51.0%) received fall risk management given they had fall or balance problems (Table 7). The most vulnerable group with convergence of all three risk factors (Black—low education—poor health) was most likely to receive fall risk management, whereas the White, non-Hispanic—low education—poor health group was most likely to discuss fall risk.

Osteoporosis Testing in Older Women

Overall, a larger proportion (69.2%) of individuals reported receipt of osteoporosis testing than any other preventive service (Table 8). Unlike other preventive services, there are strong racial/ethnic differences favoring non-Hispanic Whites over non-Hispanic Blacks in receipt of osteoporosis testing. The non-Hispanic White—low education—good health group was most likely to receive osteoporosis testing, relative to other groups. Their poor health counterparts (non-Hispanic White—low education—poor health group) were the next group most likely to receive osteoporosis testing. The non-Hispanic Black—high education groups, whether good health or poor health, were least likely to receive osteoporosis testing.

Tables 9-12 present the results of the hierarchical multivariable regression analysis; Table 13 provides a summary of multivariable results across all areas. Patterns observed in the bivariate analysis generally persisted in the multivariable results, even after controlling for other factors. The combination of more than one risk factor often was the best predictor of receipt of services, and the combination of all three risk factors (being in the Black—low education—poor health group) was the strongest predictor of receiving preventive services for 3 of the 7 outcomes (discussing urinary incontinence, being advised on physical activity, and receiving fall risk management). The exception to this pattern was osteoporosis testing in older women. Blacks had significantly lower odds of receiving osteoporosis testing than non-Hispanic White, regardless of education level or health status. Interestingly, among high education—good health groups, there were no significant differences between non-Hispanic Whites and non-Hispanic

Blacks in having had a recommended discussion with their doctor, whether discussing urinary incontinence, physical activity or fall risk.

5.0 DISCUSSION

Overall, this study found that there were shortfalls in receipt of preventive services across all areas of care examined, with no more than 70% of respondents reporting receipt for any given service. Different facets of preventive counseling or care services were associated with particular vulnerability profiles. In general, a gradient, “dose-response” association was observed. Individuals in vulnerability groups with more risks were likelier to receive more preventive services (with the exception of receipt of osteoporosis testing), relative to individuals in other vulnerability groups. This study found that vulnerable individuals were more likely to receive preventive services related to urinary incontinence, physical activity, and fall risk. Overall, being in a vulnerability group with any one of the risk factors of being non-Hispanic Black, low education, or in poor health was significantly associated with receipt of preventive services in most areas of care (excepting osteoporosis testing). Being in a vulnerability group combining any two risk factors was often a better predictor, and being in the vulnerability group combining all three risk factors was the best or second-best predictor in receipt of the majority of services. Indeed, having all three risk factors of being Black, low education and in poor health was the strongest predictor in receipt of three of the seven recommended preventive services. The exception was osteoporosis testing in older women, with non-Hispanic Whites reporting higher odds of receiving testing than non-Hispanic Blacks, regardless of education or health status.

There may be several explanations for these findings, which are generally in striking contrast to the disparities literature. First, it is possible that Medicare beneficiaries perceived as being

“higher risk” are indeed targeted for preventive services related to counseling or care. Patients who are in poor health have higher risk for adverse health outcomes in general, and their doctors/providers may be likelier to target them for primary or secondary prevention in order to avoid or minimize future health problems. Likewise, those who have lower education or who are racial/ethnic minorities may be also be singled out for preventive services because their very socioeconomic or minority status puts them at overall risk for adverse health outcomes. With osteoporosis testing in older women, in which racial/ethnic differences favored Non-Hispanic Whites over non-Hispanic Blacks (rather than favoring Blacks over Whites as in other preventive services), risk considerations are also very likely driving the observed results. Non-Hispanic Whites are at higher risk for developing osteoporosis than Blacks. Thus, the observed results may have been clinically-driven and in accordance with recommended preventive service guidelines, with Whites being targeted for osteoporosis testing at a higher rate than other groups because of their perceived greater risk for osteoporosis. In general, it is possible that these findings simply signal progress in overall efforts to reduce disparities in Medicare managed care plans, and specific efforts to provide recommended preventive services to “at risk” members, whether their risk involves being in poorer health, lower socioeconomic status or a racial/ethnic minority.

Second, there is also the possibility of response bias. This study relied on self-reported data and while we were not able to methodologically ascertain response bias, it is possible that Medicare managed care members who report any of the risk factors may be more likely to also report having discussed something with their doctor or provider, or having received management or

treatment for certain problems. A literature search did not find studies that addressed this type of response bias, but its possibility cannot be ruled out.

There were several other findings from this analysis. First, this study demonstrates that vulnerability can be operationalized as a convergence of multiple risk factors. The concept of vulnerability as a combination of multiple risks is commonly discussed, yet there is a paucity of literature on efforts to actually operationalize vulnerability as a convergence of risks. As such, this analysis corroborates and adds further validity and empirical evidence to the small but important literature regarding operationalization of the vulnerability concept.^{3,6-7,16}

Second, despite some positive outcomes, there is still room for improvement in several areas. For both physical activity and urinary incontinence, more than one-half of individuals reported discussing the issue, but few reported receiving treatment/management for it. For example, 52.2% reported discussing physical activity but just 45.1% were being advised on it, and 54.9% discussed urinary incontinence but only 40.6% received treatment for it. In addition, there were overall shortfalls in receipt of preventive services. No more than 70% of eligible respondents reported receiving any preventive service, ranging from a low of 22.5% for discussing fall risk to a high of 69.2% for receiving osteoporosis testing. For most preventive services, only about one-half or less of eligible respondents reported receiving services. There are several possible explanations for the shortfalls. Falls and osteoporosis are “invisible” threats. Falls are often the first, gateway event to dramatic declines in health, yet are not necessarily preceded by obvious health problems. Osteoporosis also is “invisible” in that it does not manifest outwardly until after the problem has reached a significant extent. Fall risk discussion or osteoporosis testing

are activities that most individuals may not partake in until after a significant health event occurs. With respect to urinary incontinence, while the problem manifests itself outwardly and obviously from the start, it is possible that there is stigma surrounding the condition, making people less hesitant to discuss or seek treatment for it. Finally, with respect to physical activity, the elderly population may view themselves as not being able to reap the benefits of physical activity that younger adults may. They may regard their age as a barrier to participation in physical activity, or they may regard very modest activity as being “good enough” given their advancing age, and not discuss or seek advice on it. These concerns and issues may need to be addressed in order to reduce the observed shortfalls.

Third, vulnerability risk factors tend to cluster and addressing multiple risk factors may be important in examining disparities. The convergence of certain vulnerability risk factors resulted in higher odds of receiving preventive services than other factors. Non-Hispanic Black individuals with low education and poor health exhibited the highest or second highest odds of receiving preventive services than individuals in any other vulnerability category, with the exception of receiving osteoporosis testing. Of these, only one result, for urinary incontinence treatment, did not achieve statistical significance, likely because of relatively low sample size. The combination of low education and poor health were often the best predictors of receipt of preventive services. On the other hand, as long as individuals had both high education and were in good health, race/ethnicity made no difference in receipt of all preventive services related to discussions with a doctor, whether it was discussion of urinary incontinence problems, physical activity or fall and balance (fall risk) problems. These patterns suggest that not all vulnerability traits are “created equal” and that vulnerability status may be more than just a simple “sum of its

parts.” Whenever there was a convergence of two non-vulnerable attributes, such as high education and good health, the presence of the third vulnerability trait of reporting Black race/ethnicity made a non-significant or a relatively small difference in receiving preventive services. Yet, if there was a convergence of other vulnerability traits, the addition of just one more vulnerability trait can increase the odds of receiving services. For example, among those with high education and poor health, Blacks had significantly higher odds of receiving services than Non-Hispanic Whites in four of the seven outcomes (discussing and being advised on physical activity, receiving fall risk management, and discussing urinary incontinence). These findings underscore the fact that many vulnerable subgroups experience an amalgam of simultaneously-occurring risk factors. Addressing separate, rather than combined, effects of multiple risk factors may obscure what is actually happening. These findings also underscore the importance of building Medicare datasets rich enough with regard to sample sizes that would allow for analysis of more converging risks and/or variables at fine enough levels of categorizations to most accurately reflect reality.

5.1 Limitations

There are several limitations to this study.

- First, small sample sizes limited the ability to formulate a vulnerability status measure capturing finer levels of vulnerability (e.g., incorporating additional race/ethnicity categories or education levels).
- Second, the vulnerability status measure also did not include other risk factors that may be important (e.g., veteran status, income level, lack of social support, language barriers). Future efforts could expand on this study by increasing overall sample sizes to address

this problem and including other important vulnerability characteristics, so as to develop a more sophisticated measure of vulnerability status.

- Third, most of the measures assessing receipt of preventive services refer to the 12 month window prior to when the HOS was fielded. However, regular timely provision is a key component in preventive services such as counseling, management or screening. To the extent that individuals do not receive timely, regular care, they may risk developing problems that could have been avoided. Information on managed care members who receive a service within the past 12 months of HOS fielding, yet go for large intervals of time without receiving services, would not be captured.
- Fourth, this study does not include other important aspects of quality of care in its assessment of disparities and vulnerability, including patient-physician relationship, patient satisfaction or other outcome measures.
- Fifth, the health status measure used in this study represents self-reported health. While this is an important dimension of health (assessing health from the perspective of the patient), other types of health measures could have supplemented and strengthened the findings, including the use of services or clinical diagnoses of conditions and co-morbidities. Since claims data in the Medicare managed care setting are not a well-developed area of data collection and record-keeping, it may be some time before this limitation can be adequately addressed.

6.0 POLICY IMPLICATIONS AND RECOMMENDATIONS

The Medicare Health Outcomes Survey is the largest-scale effort to evaluate health outcomes among the elderly Medicare population in the United States, and serves as a platform for evaluating the quality of care and addressing comprehensive health needs of the elderly, particularly vulnerable groups. As such, the HOS is a valuable tool in targeting and improving the quality of care in Medicare managed care.

In general, the results of this study are striking in that vulnerable subgroups in Medicare managed care are significantly more likely to receive recommended preventive services across important health areas in the older population. It is possible that overall efforts to equalize disparities in Medicare managed care are having an observable effect, and the findings from this study bear that out. In light of this, these findings provide important empirical evidence that such efforts are making a difference of at least some magnitude and in the desired direction. This information also supports continued efforts to address disparities and improve provision of preventive services in Medicare managed care.

The findings from this study will also be of interest to several audience groups. Medicare Advantage plans are a primary audience. They are required to collect and report quality information to CMS through NCQA and are expected to conduct quality improvement interventions with network providers and enrollees. This information sheds light on the potential ramifications of quality improvement aimed at addressing disparities and/or improving preventive services. This information will also help efforts to appropriately target information to

Medicare beneficiaries to raise awareness of gaps in quality of preventive care that undermine their health. Medicare beneficiaries are another important audience as they may use this information to compare and select health plans. Policy-makers such as Congress and CMS are also an important audience as they can evaluate the effectiveness of policy decisions on extending Medicare benefit coverage to preventive care in the Medicare Advantage program.

This information is particularly useful to stakeholders since claims data on under-diagnosed and under-reported conditions such as fall risk and urinary incontinence are known to underestimate the true extent of these problems in the elderly population. Furthermore, while health plans routinely collect patient satisfaction data from members through member satisfaction surveys or other surveys to assess customer service performance, they do not usually collect data on processes of care or health outcomes directly from members. Data from these seven HOS quality measures provide insight on prevalent, but under-recognized conditions, which require greater attention involving prevention and more effective management by providers, health plans and patient educators. National rates reported will also be of tremendous importance to policy-makers, Congress, and CMS to inform and evaluate policy and benefit coverage decisions, such as Medicare's new benefit to pay for a one-time physical exam ("Welcome to Medicare Physical Exam" for new Medicare beneficiaries). Medicare also covers hearing and balance exams and bone density testing every two years for osteoporosis. HOS 2006 data will provide comparative data about these benefits and facilitate the ongoing monitoring of this coverage on the quality of preventive care.

Dissemination of study results can also be targeted to the following major stakeholders for actionability:

- 1) Medicare beneficiaries and patient advocacy organizations: to support patient health education, as well as plan selection decisions
- 2) Policy-makers and regulators: to evaluate policy-decisions regarding the Medicare program and benefits
- 3) Others interested in quality: public health agencies or professional societies engaged in physician or patient education

6.1 Recommendations for Quality Improvement

The results of this study indicate that Medicare managed care members perceived as being higher risk were targeted for receipt of preventive services. There were general shortfalls in the overall proportion of eligible beneficiaries who should, but are not receiving preventive services.

Strategies to improve quality of care should increase awareness and identify best practices to minimize disparities in the provision of health care and health services overall, as well as ways to improve receipt and provision of important preventive services.

There are several types of interventions health plans can employ for improvement in preventive services:

- 1) Patient focused: education and support tools
- 2) Physician focused: education; guidelines; support tools in practices; and physician profiling/performance incentives

Other key stakeholders who can play a role in quality improvement include:

- 3) Policy-makers: Medicare reimbursement/coverage for preventive care; contracting requirements with Medicare health plans
- 4) Public health: campaigns; tool-kits and outreach/awareness raising
- 5) Professional societies and other organizations: geriatric sub-specialty/family practitioners' continuing medical education conferences and re-certification programs.

In addition, specific recommendations for key stakeholders are outlined here:

Health Plans: Health plans have not been familiar with using results from the HOS survey for quality of care interventions, partly because results from the longitudinal survey are not released until the end of the cohort, and also because plans may not know how to target interventions to patients and physicians based on results from only a sample of members. CMS and NCQA should additionally provide guidance in quality improvement toolkits on approaches health plans can use to target and focus efforts to equalize disparities, and to increase provision and receipt of preventive services.

Providers: Including practicing physicians in the development of quality of care and quality improvement toolkits will be an important part of successfully addressing disparities while improving provision of preventive services. Professional societies can also be invited to participate in efforts to improve quality of geriatric care and preventive counseling.

Professional societies: Professional societies for internal medicine (e.g. American College of Physicians) and family practice (e.g. American Association of Family Practice) have recently

been developing strategies to improve quality of geriatric care in the areas of fall risk, urinary incontinence, and other clinical areas through recertification and continuing medical education programs. The American Geriatric Society has also implemented a Practicing Physician Education Project for Geriatric Syndromes that provides a toolkit for physicians to address memory loss, urinary incontinence, fall risk, and depression. The toolkit provides proposed communication strategies to optimize visit time, screening tools and other conditions, and handouts for patients to address chronic conditions relevant for geriatric patients.

Measurement tools for recertification and ongoing educational programs also include patient and physician surveys or medical record audits to conduct quality improvement interventions. Some of these measurement tools include the survey questions used in the HOS to assess fall risk management and urinary incontinence management. Coordinating proposed quality improvement interventions by health plans, Quality Improvement Organizations (QIOs) and CMS with professional societies' efforts will align incentives for physicians and ensure comparable standards are articulated, to minimize potential confusion.

Patient Advocacy and Public Health Agencies: Patient education, public health awareness campaigns through local community groups, Administration on Aging area offices, senior groups like AARP, and other patient advocacy organizations can add to health plan and provider initiated quality improvement interventions that target patients and physicians. Seniors often rely on local sources for health information, in addition to interactions with providers. Increasing awareness of the importance of preventive counseling among seniors and their caregivers is a key component to initiating discussions in the context of a medical visit. Patients and caregivers

can ask questions about their risk for falls, osteoporosis, or urinary incontinence; whether their current physical activity levels are adequate; and if they should participate in a local exercise program as a means to strengthening balance to prevent falls.

Table 1: Independent Variables and Description

VARIABLE	DESCRIPTION
Main Independent Variable	
Vulnerability Status: Created by combining below 3 self-reported variables: <ul style="list-style-type: none"> • Race • Education Level, and • General Health Status 	See Table 3 for the 8-level vulnerability status variable, based on combining three vulnerability attributes that were recoded into dichotomous categories
Covariates	
Age	In years
Gender	Male or female
Marital status	Married, widowed, divorced, separated, or never married
Enrollment duration	Time enrolled in plan (in months)
Geographic census region	Geographic census region in which the individual resides, from a total of 9 regions: New England (CT, MA, ME, NH, RI, VT), Mid-Atlantic (NJ, NY, PA), East North Central (IN, IL, MI, OH, WI), West North Central (IA, KS, MN, MO, NE, ND, SD), South Atlantic (DE, DC, FL, GA, MD, NC, SC, VA, WV), East South Central (AL, KY, MS, TN), West South Central (AR, LA, OK, TX), Mountain (AZ, CO, ID, MT, NM, NV, UT, WY); Pacific (AK, CA, HI, WA, OR); plus US territories (PR, VI)
Survey indicator	Whether completed Cohort 9 baseline or Cohort 7 follow-up HOS

Table 2: Main Independent Variable: Vulnerability Status, By Type of Factor

Predisposing Factor: Self-Reported Race	Enabling Factor: Education Level • High education = at least some college or above • Low education = high school grad/GED or below)	Need Factor: Self-Rated Health Status • Good health = Excellent, very good or good • Poor health = fair or poor
1. White	High education	Good health (Least vulnerable category, with none of the vulnerability factors)
2. White	High education	Poor health
3. Black	High education	Good health
4. Black	High education	Poor health
5. White	Low education	Good health
6. White	Low education	Poor health
7. Black	Low education	Good health
8. Black	Low education	Poor health Most vulnerable category, with all three vulnerability factors

Table 3: Dependent Variables, Description, Denominator, Numerator, Year Added to HOS

DEPENDENT VARIABLE	DESCRIPTION	DENOMINATOR	NUMERATOR	YEAR ADDED TO HOS
Urinary Incontinence	(1) Whether talked to doctor about UI problems (yes/no)	Anyone 65+ who reported having UI that was a ‘big’ or ‘small’ problem past 6 months, and who answered ‘yes’ or ‘no’ to this question	Discussed UI problem with doctor	2004
	(2) Whether received treatment for UI problems (yes/no)	Anyone 65+ who reported having UI that was a ‘big’ or ‘small’ problem past 6 months, and who answered ‘yes’ or ‘no’ to this question	Received UI treatment	2004
Physical Activity	(3) Whether talked about PA with doctor past 12 months (yes/no)	Anyone 65+ who saw doctor past 12 months, and who answered ‘yes’ or ‘no’ to this question	Discussed PA with doctor	2005
	(4) Whether doctor advised on starting, increasing or maintaining PA levels past 12 months (yes/no)	Anyone 65+ who saw doctor past 12 months, and who answered ‘yes’ or ‘no’ to this question	Doctor advised PA	2005
Fall Risk	(5) Whether talk about falling or balance/walking problems with doctor past 12 months (yes/no)	Anyone 75+ , or anyone 65-74 years who reported having had a fall or balance problem past 12 months; who saw doctor in past 12 months; and who answered ‘yes’ or ‘no’ to this question	Discussed fall risk with doctor	2006
	(6) Whether doctor provided fall risk management past 12 months (e.g., ways to prevent or treat fall	Anyone 75+, or anyone 65-74 years who reported having had a fall or balance problem past 12 months, who	Doctor provided fall risk management	2006

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DEPENDENT VARIABLE	DESCRIPTION	DENOMINATOR	NUMERATOR	YEAR ADDED TO HOS
	problems, including: suggest use of cane/walker, check blood pressure, suggest exercise, suggest vision/hearing test): (yes/no)	saw doctor in past 12 months, and who answered 'yes' or 'no' to this question		
Osteoporosis Testing	(7) Whether ever had a bone-density test (yes/no)	Any woman 65+ who answered 'yes' or 'no' to this question	Whether ever received an osteoporosis test	2006

Table 4: Distribution of Vulnerability Status among Medicare Managed Care Members, 2006

Vulnerability Status*	2006 Study Sample N=110,238 (%)
TOTAL	110,238 (100.0)
White – High Education	
Good health	44,489 (40.7)
Poor health	16,474 (14.9)
White – Low Education	
Good health	34,993 (31.7)
Poor health	7,095 (6.4)
Black – High Education	
Good health	2,899 (2.6)
Poor health	2,176 (2.0)
Black – Low Education	
Good health	1,565 (1.4)
Poor health	547 (0.5)

*White indicates self-reported non-Hispanic White race/ethnicity. Black indicates self-reported non-Hispanic Black or African-American race/ethnicity. High education indicates self-reported completion of some college or higher in response to the question “What is the highest grade or level of school that you have completed?” Low education indicates self-reported completion of high school (but no college) or less. Good health indicates a response of “Excellent,” “Very good,” or “Good” to the question “In general, would you say your health is?” Poor health indicates a response of “Fair” or “Poor.”

Table 5: Observed Rates of Vulnerability Status and Urinary Incontinence (UI) Preventive Services: Medicare Managed Care Members, 2006

	URINARY INCONTINENCE PREVENTIVE SERVICES			
	Discussed UI With Doctor		Received UI Treatment	
	Number of Eligible Members	N (%) of Eligible Members Who Discussed UI With Doctor*	Number of Eligible Members	N (%) of Eligible Members Who Received Treatment for UI*
OVERALL	29,534	16,216 (54.9)	29,424	10,395 (35.3)
VULNERABILITY STATUS				
White – High Education				
Good health	10,427	5,422 (52.0)	10,376	3,527 (34.0)
Poor health	6,280	3,480 (55.4)	6,256	2,079 (33.2)
White – Low Education				
Good health	8,544	4,782 (56.0)	8,512	3,221 (37.8)
Poor health	2,808	1,701 (60.6)	2,807	1,059 (37.7)
Black – High Education				
Good health	414	210 (50.7)	411	131 (31.9)
Poor health	603	341 (56.6)	603	190 (31.5)
Black – Low Education				
Good health	289	177 (61.2)	289	119 (41.2)
Poor health	169	103 (60.9)	170	69 (40.6)

* $P \leq 0.0001$ for the χ^2 across vulnerability status groups who reported receiving a given preventive counseling, compared to those who did not receive the service.

Table 6: Observed Rates of Vulnerability Status and Physical Activity (PA) Preventive Services: Medicare Managed Care Members, 2006

	PHYSICAL ACTIVITY PREVENTIVE SERVICES			
	Discussed Physical Activity With Doctor		Doctor Advised Physical Activity	
	Number of Eligible Members n=102,215	N (%) of Eligible Members Who Discussed Physical Activity With Doctor*	Number of Eligible Members n=103,643	N (%) of Eligible Members Whose Doctor Advised Physical Activity*
OVERALL	102,215	53,354 (52.2)	103,643	46,761 (45.1)
VULNERABILITY STATUS				
White – High Education				
Good health	40,665	19,093 (47.0)	41,481	16,814 (40.5)
Poor health	15,351	7,341 (47.8)	15, 572	6,630 (42.6)
White – Low Education				
Good health	32,738	19,519 (59.6)	32,960	16,480 (50.0)
Poor health	6,731	4,112 (61.1)	6,763	3,512 (51.9)
Black – High Education				
Good health	2,696	1,195 (44.3)	2,761	1,219 (44.2)
Poor health	2,034	947 (46.6)	2,084	1,053 (50.5)
Black – Low Education				
Good health	1,484	852 (57.4)	1,500	764 (50.9)
Poor health	516	295 (57.2)	522	289 (55.4)

* $P \leq 0.0001$ for the χ^2 across vulnerability status groups who reported receiving a given preventive service, compared to those who did not receive the service.

Table 7: Observed Rates of Vulnerability Status and Fall Risk Preventive Services: Medicare Managed Care Members, 2006

	FALL RISK PREVENTIVE SERVICES			
	Discussed Fall Risk With Doctor		Received Fall Risk Management	
	Number of Eligible Members n = 69,726	N (%) of Eligible Members Who Discussed Fall Risk With Doctor*	Number of Eligible Members n= 36,253	N (%) of Eligible Members Who Received Fall Risk Management*
OVERALL	69,726	15,659 (22.5)	36,253	18,484 (51.0)
VULNERABILITY STATUS				
White – High Education				
Good health	26,338	4,176 (15.9)	10,749	4,628 (43.1)
Poor health	13,016	4,434 (34.1)	9,147	5,569 (60.9)
White – Low Education				
Good health	20,218	3,674 (18.2)	9,472	4,076 (43.0)
Poor health	5,804	2,328 (40.1)	4,420	2,754 (62.3)
Black – High Education				
Good health	1,568	251 (16.0)	656	344 (52.4)
Poor health	1,599	486 (30.4)	1,120	724 (64.6)
Black – Low Education				
Good health	785	169 (21.5)	389	195 (50.1)
Poor health	398	141 (35.4)	300	194 (64.7)

* $P \leq 0.0001$ for the χ^2 across vulnerability status groups who reported receiving a given preventive service, compared to those who did not receive the service

Table 8: Observed Rates of Vulnerability Status and Osteoporosis Testing in Older Women: Medicare Managed Care Members, 2006

	Number of Eligible Female Members n=64,841	N (%) Of Eligible Female Members Who Ever Received Osteoporosis Testing*
OVERALL	64,841	44,884 (69.2)
VULNERABILITY STATUS		
White – High Education		
Good health	28,351	19,456 (68.6)
Poor health	10,211	6,411 (62.8)
White – Low Education		
Good health	17,924	14,197 (79.2)
Poor health	3,645	2,601 (71.4)
Black – High Education		
Good health	1,836	810 (44.1)
Poor health	1,455	633 (43.5)
Black – Low Education		
Good health	1,032	568 (55.0)
Poor health	387	208 (53.7)

* $P \leq 0.0001$ for the χ^2 across vulnerability status groups who reported ever having osteoporosis testing, compared to those who did not have testing.

Table 9: Multivariate Analysis of Vulnerability Status and Urinary Incontinence (UI) Preventive Services: Medicare Managed Care Members, 2006

INDEPENDENT VARIABLE: VULNERABILITY STATUS	DEPENDENT VARIABLE: URINARY INCONTINENCE PREVENTIVE SERVICES^a	
	Model 1: Discussed Urinary Incontinence With Doctor Odds Ratio (95% CI)	Model 2: Received Urinary Incontinence Treatment Odds Ratio (95% CI)
White – High Education Good health Poor health	Reference 1.13 (1.05-1.20)**	Reference 0.98 (0.91-1.05)
White – Low Education Good health Poor health	1.14 (1.09-1.20)** 1.33 (1.22-1.46)**	1.17 (1.10-1.24)** 1.18 (1.07-1.30)**
Black – High Education Good health Poor health	0.94 (0.78-1.14) 1.23 (1.05-1.45)	0.94 (0.75-1.17) 0.93 (0.79-1.10)
Black – Low Education Good health Poor health	1.47 (1.14-1.89)* 1.55 (1.14-2.12)*	1.37 (1.11-1.69)* 1.38 (1.00-1.91)

A Bonferroni correction was applied to account for the testing of seven simultaneous outcomes from the same dataset. Thus, only a p-value less than $0.05/7 = 0.007$ provides evidence of a vulnerability status effect in the given effectiveness of care measure.

*p<.007, **p<.001

^a Regressions adjusted for age, gender, marital status, enrollment duration, geographic census region, and survey cohort.

Table 10: Multivariate Analysis of Vulnerability Status and Physical Activity (PA) Preventive Services: Medicare Managed Care Members, 2006

INDEPENDENT VARIABLE: VULNERABILITY STATUS	DEPENDENT VARIABLE: PHYSICAL ACTIVITY PREVENTIVE SERVICES^a	
	Model 3: Discussed Physical Activity With Doctor Odds Ratio (95% CI)	Model 4: Doctor Advised Physical Activity Odds Ratio (95% CI)
White – High Education		
Good health	Reference	Reference
Poor health	1.10 (1.06-1.15)**	1.17 (1.13-1.22)**
White – Low Education		
Good health	1.59 (1.54-1.64)**	1.41 (1.37-1.46)**
Poor health	1.81 (1.72-1.91)**	1.65 (1.56-1.74)**
Black – High Education		
Good health	0.98 (0.90-1.06)	1.22 (1.11-1.33)**
Poor health	1.13 (1.03-1.24)*	1.66 (1.52-1.80)**
Black – Low Education		
Good health	1.55 (1.40-1.73)**	1.48 (1.34-1.64)**
Poor health	1.60 (1.35-1.90)**	1.83 (1.56-2.16)**

A Bonferroni correction was applied to account for the testing of seven simultaneous outcomes from the same dataset. Thus, only a p-value less than $0.05/7 = 0.007$ provides evidence of a vulnerability status effect in the given effectiveness of care measure.

*p<.007, **p<.001

^a Regressions adjusted for age, gender, marital status, enrollment duration, geographic census region, and survey cohort.

Table 11: Multivariate Analysis of Vulnerability Status and Fall Risk Preventive Services: Medicare Managed Care Members, 2006

INDEPENDENT VARIABLE: VULNERABILITY STATUS	DEPENDENT VARIABLE: FALL RISK PREVENTIVE SERVICES^a	
	Model 5: Discussed Fall Risk with Doctor Odds Ratio (95% CI)	Model 6: Received Fall Risk Management Odds Ratio (95% CI)
White,– High Education Good health Poor health	Reference 2.74 (2.61-2.88)**	Reference 2.07 (1.94-2.21)**
White,– Low Education Good health Poor health	1.20 (1.13-1.26)** 3.60 (3.38-3.84)**	1.06 (1.00-1.13) 2.29 (2.14-2.47)**
Black – High Education Good health Poor health	0.98 (0.84-1.14) 2.19 (1.98-2.42)**	1.53 (1.28-1.83)** 2.54 (2.20-2.94)**
Black – Low Education Good health Poor health	1.39 (1.14-1.68)** 2.69 (2.21-3.29)**	1.47 (1.18-1.83)** 2.63 (2.10-3.29)**

A Bonferroni correction was applied to account for the testing of seven simultaneous outcomes from the same dataset. Thus, only a p-value less than $0.05/7 = 0.007$ provides evidence of a vulnerability status effect in the given effectiveness of care measure.

*p<.007, **p<.001

^a Regressions adjusted for age, gender, marital status, enrollment duration, geographic census region, and survey cohort.

Table 12: Multivariate Analysis of Vulnerability Status and Osteoporosis Testing in Older Women: Female Medicare Managed Care Members, 2006

INDEPENDENT VARIABLE: VULNERABILITY STATUS	Model 7 DEPENDENT VARIABLE: EVER RECEIVED OSTEOPOROSIS TESTING^a Odds Ratio (95% CI)
White – High Education Good health Poor health	Reference 0.84 (0.80-0.88)**
White – Low Education Good health Poor health	1.69 (1.62-1.77)** 1.20 (1.11-1.30)**
Black – High Education Good health Poor health	0.39 (0.36-0.44)** 0.41 (0.36-0.46)**
Black – Low Education Good health Poor health	0.56 (0.49-0.64)** 0.57 (0.47-0.69)**

A Bonferroni correction was applied to account for the testing of seven simultaneous outcomes from the same dataset. Thus, only a p-value less than $0.05/7 = 0.007$ provides evidence of a vulnerability status effect in the given effectiveness of care measure.

*p<.007, **p<.001

^a Regression adjusted for age, gender, marital status, enrollment duration, geographic census region, and survey cohort.

Table 13: Multivariate Analysis of Vulnerability Status and Preventive Services: All Services

	DEPENDENT VARIABLES: URINARY INCONTINENCE, PHYSICAL ACTIVITY, FALL RISK, AND OSTEOPOROSIS TESTING SERVICES						
INDEPENDENT VARIABLE: VULNERABILITY STATUS	Discussed Urinary Incontinence	Received Urinary Incontinence Treatment	Discussed Physical Activity	Advised Physical Activity	Discussed Fall Risk	Received Fall Risk Management	Ever Had Osteoporosis Testing (Females Only)
White – High Education	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Good health							
Poor health	1.13 (1.05-1.20)	0.98 (0.91-1.05)	1.10 (1.06-1.15)	1.17 (1.13-1.22)	2.74 (2.61-2.88)	2.07 (1.94-2.21)	0.84 (0.80-0.88)
White – Low Education							
Good health	1.14 (1.09-1.20)	1.17 (1.10-1.24)	1.59 (1.54-1.64)	1.41 (1.37-1.46)	1.20 (1.13-1.26)	1.06 (1.00-1.13)	1.69 (1.62-1.77)
Poor health	1.33 (1.22-1.46)	1.18 (1.07-1.30)	1.81 (1.72-1.91)	1.65 (1.56-1.74)	3.60 (3.38-3.84)	2.29 (2.14-2.47)	1.20 (1.11-1.30)
Black – High Education							
Good health	0.94 (0.78-1.14)	0.94 (0.75-1.17)	0.98 (0.90-1.06)	1.22 (1.11-1.33)	0.98 (0.84-1.14)	1.53 (1.28-1.83)	0.39 (0.36-0.44)
Poor health	1.23 (1.05-1.45)	0.93 (0.79-1.10)	1.13 (1.03-1.24)	1.66 (1.52-1.80)	2.19 (1.98-2.42)	2.54 (2.20-2.94)	0.41 (0.36-0.46)

	DEPENDENT VARIABLES: URINARY INCONTINENCE, PHYSICAL ACTIVITY, FALL RISK, AND OSTEOPOROSIS TESTING SERVICES						
INDEPENDENT VARIABLE: VULNERABILITY STATUS	Discussed Urinary Incontinence	Received Urinary Incontinence Treatment	Discussed Physical Activity	Advised Physical Activity	Discussed Fall Risk	Received Fall Risk Management	Ever Had Osteoporosis Testing (Females Only)
Black – Low Education							
Good health	1.47 (1.14-1.89)	1.37 (1.11-1.69)	1.55 (1.40-1.73)	1.48 (1.34-1.64)	1.39 (1.14-1.68)	1.47 (1.18-1.83)	0.56 (0.49-0.64)
Poor health	1.55 (1.14-2.12)	1.38 (1.00-1.91)	1.60 (1.35-1.90)	1.83 (1.56-2.16)	2.69 (2.21-3.29)	2.63 (2.10-3.29)	0.57 (0.47-0.69)

A Bonferroni correction was applied to account for the testing of seven simultaneous outcomes from the same dataset. Thus, only a p-value less than $0.05/7 = 0.007$ provides evidence of a vulnerability status effect in the given effectiveness of care measure.

7.0 REFERENCES

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- ¹⁹ Details on the HOS survey instrument and administration procedures may be found in *HEDIS Volume 6 – Specifications for the Medicare Health Outcomes Survey* or on the HOS Website (<http://www.hosonline.org>).
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