Published in final edited form as:

J Am Geriatr Soc. 2019 March ; 67(3): 581–587. doi:10.1111/jgs.15754.

Comparative Effectiveness of Medication Therapy Management Eligibility Criteria across Racial/Ethnic Groups

Christina A. Spivey, PhD¹ [Associate Professor, Director of Assessment],

Department of Clinical Pharmacy and Translational Science, University of Tennessee College of Pharmacy, 881 Madison Avenue, Room 258, Memphis, TN 38163, Phone: 901-448-7141, Fax: 901-448-7053, cspivey3@uthsc.edu

Yanru Qiao, MS¹ [Data Analyst],

Health Outcomes and Policy Research, Department of Clinical Pharmacy and Translational Science, University of Tennessee College of Pharmacy, 881 Madison Avenue, Room 212, Memphis, TN 38163, Phone: 901-448-3522, Fax: 901-448-1221, yqiao1@uthsc.edu

Junling Wang, PhD¹ [Professor],

Health Outcomes and Policy Research, Department of Clinical Pharmacy and Translational Science, University of Tennessee College of Pharmacy, 881 Madison Avenue, Room 221, Memphis, TN 38163, Phone: 901-448-3601, Fax: 901-448-1221, jwang26@uthsc.edu

Ya-Chen Tina Shih, PhD² [Professor, Chief],

Department of Health Services Research, Section of Cancer Economics and Policy, Department of Health Services Research, The University of Texas MD Anderson Cancer Center, Houston, TX 77024, Phone: 713-563-2750, yashih@mdanderson.org

Jim Y. Wan, PhD³ [Professor],

Department of Preventive Medicine, University of Tennessee College of Medicine, 66 N. Pauline, Suite 633, Memphis, TN 38163, Phone: 901-448-8221, Fax: 901-448-7041, jwan@uthsc.edu

Samuel Dagogo-Jack, MD³ [Mullins Professor & Director],

Division of Endocrinology, Diabetes & Metabolism, Clinical Research Center, University of Tennessee College of Medicine, 920 Madison Avenue, Suite 300A, Memphis, TN 38163, Phone: 901-448-5318, Fax: 901-448-5332, sdj@uthsc.edu

William C. Cushman, MD^{3,4} [Professor, Chief],

Corresponding Author Junling Wang, PhD, Professor, Health Outcomes and Policy Research, Department of Clinical Pharmacy and Translational Science, University of Tennessee College of Pharmacy, 881 Madison Avenue, Room 221, Memphis, TN 38163, Phone: 901-448-3601, Fax: 901-448-1221, jwang26@uthsc.edu.

Author contributions: All authors contributed to the study concept and design, analysis and interpretation of data, and preparation of the manuscript. Wang and Qiao acquired data. The authors would like to acknowledge the research assistance from Mimi Nguyen, a PharmD student, suggestions to increase clinical relevance of the paper from three clinicians, Timothy H. Self, PharmD, Robert B. Parker, PharmD, and Christa M. George, PharmD, and editorial comments from Richard Redfearn, PhD, Director of Scientific Writing, at the corresponding author's institution.

Previous Presentations

We have presented this study as a poster at the AMCP Managed Care and Specialty Pharmacy Annual Meeting in 2018 and received Bronze Prize Ribbon. We also presented this study as a poster at the 2018 Annual International Meeting of the International Society for Pharmacoeconomics and Outcomes Research and received a recognition of Best Poster Presentation Award Finalist. We have presented it as a podium presentation at the 2018 American Public Health Association Annual Meeting.

Conflict of Interests: The authors have no financial, personal, or any other conflict of interest in this paper.

Department of Preventive Medicine and Medicine, University of Tennessee College of Medicine, Preventive Medicine Section, Veterans Affairs Medical Center, 1030 Jefferson Avenue, Room 5159, Memphis, TN 38104, Phone: 901-577-7357, Fax: -901-577-7457, william.cushman@va.gov

Lisa E. Hines, PharmD⁵ [Senior Director of Measure Operations & Analytics], and Pharmacy Quality Alliance, 5911 Kingstowne Village Parkway, Suite 130, Alexandria, VA 22315, Phone: 703-347-7963, lhines@pqaalliance.org

Marie A. Chisholm-Burns, PharmD, MPH, MBA¹

University of Tennessee College of Pharmacy, 881 Madison Avenue, Room 264, Memphis, TN 38163, Phone: 901-448-6036, Fax: 901-448-7053, mchisho3@uthsc.edu

¹University of Tennessee College of Pharmacy

²The University of Texas MD Anderson Cancer Center

³University of Tennessee College of Medicine

⁴Veterans Affairs Medical Center

⁵Pharmacy Quality Alliance

Abstract

Background/Objectives: Previous research indicates that eligibility criteria for medication therapy management (MTM) services in Medicare prescription drug (Part D) plans, defined under the Medicare Modernization Act (MMA), are associated with racial/ethnic disparities and ineffective in identifying individuals with medication utilization issues. Our study's objective was to determine the comparative effectiveness of MTM eligibility criteria under MMA and in the Affordable Care Act (ACA) in identifying patients with medication utilization issues across racial/ethnic groups.

Design: ACA and MMA MTM eligibility criteria were compared on proportions of eligible individuals among patients with medication utilization issues. Multinomial logistic regression was conducted to control for patient/community characteristics. Need-based and demand-based analysis strategies were used to determine disparities due to need and demand for healthcare. Main/sensitivity analyses were conducted for the range of eligibility thresholds.

Setting: Medicare data (2012-2013) linked to Area Health Resources Files.

Participants: 964,610 patients aged 65 years or older.

Measurements: Medication safety/adherence measures, developed primarily by the Pharmacy Quality Alliance, were used to determine medication utilization issues.

Results: Higher proportions of patients were eligible based on ACA than MMA MTM eligibility criteria. For example, in 2013, proportions based on ACA and MMA MTM eligibility criteria would be 99.7% and 26.2%, respectively, in the main analysis ($P < 0.001$); in the demand-based main analysis, ACA criteria were associated with 13.6% and 9.8% higher effectiveness than MMA criteria among racial/ethnic minorities than among non-Hispanic Whites.

Conclusion: ACA MTM eligibility criteria are more effective than MMA criteria in identifying older patients needing MTM, particularly among minorities.

Keywords

medication therapy management; Medicare Modernization Act; Affordable Care Act

Introduction

Since 2006, the Centers for Medicare & Medicaid Services (CMS) have required health plans for Medicare prescription drug benefit (Part D) to offer medication therapy management (MTM) services, according to the Medicare Modernization Act (MMA).¹ MTM aims to improve medication use and reduce adverse events. These services involve activities such as conducting a comprehensive medication review, formulating a medication treatment plan, and integrating the medication treatment plan into all health services.² MTM services can improve health outcomes in a cost-effective manner, particularly for management of chronic diseases such as diabetes and hypertension.²⁻⁴

Due to limited resources, MMA stipulated three eligibility criteria: taking multiple Part D drugs, having multiple chronic conditions, AND being likely to incur annual drug costs exceeding a pre-specified threshold.¹ Prior to 2010, Part D plans determined MTM eligibility thresholds within this framework.⁵ From 2010 onward, CMS modified the thresholds (ie, cannot be over 3 chronic conditions, 8 Part D drugs, and \$3,000 in drug costs) to increase MTM enrollment and reduce variability in eligibility criteria.⁶ However, participation in MTM services in Part D remained lower than the expected 25%.⁶ In another effort to boost MTM enrollment, CMS proposed to lower eligibility thresholds for 2015 to 2 chronic conditions, 2 Part D drugs and \$620 in annual drug costs.⁶ These thresholds were the least restrictive within the MMA framework. The proposed MTM changes were not implemented, however, due to stakeholders' concerns over other reforms proposed along with the MTM rules.⁷

Previous research has raised concerns related to effectiveness/equity of the MTM eligibility. For example, Stuart et al. found that patients with low medication adherence were *less likely* to be eligible for MTM than those with higher adherence because MTM eligibility criteria are predominantly based on higher medication use.⁸ Minorities, in particular, could benefit from MTM services because they are more likely than non-Hispanic Whites (Whites) to have certain chronic conditions (e.g., diabetes, hypertension) targeted by MTM and are more likely to have medication utilization issues.⁹⁻¹¹ However, previous studies documented racial/ethnic inequities in MTM eligibility because eligibility criteria are predominantly utilization-based, and racial/ethnic minorities typically use fewer prescription medications and incur lower prescription medication costs than do Whites.¹²⁻¹⁶

The 2010 Affordable Care Act (ACA) laid out the following criteria to target patients for MTM in demonstration programs: (1) taking 4 prescribed medications; (2) taking any 'high-risk' medications; (3) having 2 chronic diseases; *or* (4) having undergone a transition of care, or other factors likely to cause medication utilization issues.¹⁷ Wang et al. found that the MTM eligibility rate based on ACA MTM eligibility criteria could exceed 80% if applied to Part D enrollees.¹⁴ This is mainly because patients must only meet *one* eligibility criterion under ACA, while MMA requires patients to meet *all* eligibility criteria. CMS

previously acknowledged the value of analyzing ACA criteria to guide policy development.⁶ Medicare's MTM program is an example of rapidly proliferating value-based strategies focusing on the return on investment of health policies. This is because eligible patients seem more likely to benefit from MTM due to more complex medication regimens than ineligible patients.¹⁸ To inform policymakers on strategies to improve the effectiveness/equity of such value-based strategies, the objective of this study was to examine the comparative effectiveness of the MTM eligibility criteria under MMA and ACA in identifying patients 65 years and older with medication utilization issues across racial/ethnic groups.

Methods

Data Sources, Study Design, and Population

This retrospective study analyzed the Medicare administrative data (2012–2013) linked to Area Health Resources Files (AHRF).^{19,20} The federal database AHRF provides information on a patient's residence at county level due to unavailability of finer granularity.²⁰ We used Medicare data from 2013 for all analyses except for defining risk adjustment summary score due to the need to determine patients' Medicaid eligibility in the prior year. For AHRF, we used data from 2013 for most community characteristics except when 2013 data were not available. When that occurred, we used data from the closest years (2008 or 2010).

Theoretical Framework

We used the Gelberg-Andersen Behavioral Model for Vulnerable Populations as the theoretical framework, because the study outcome is predominantly based on the utilization and costs of prescription medications.²¹ We classified factors for health services utilization as predisposing, enabling, and need factors (Table 1).²² We classified these factors based on their potential effects on health services utilization: predisposing factors predispose patients to service utilization, enabling factors enable the service utilization, and need factors reflect patients' healthcare needs.

Study Population

We included individuals who were 65 years or older to reduce population heterogeneity. We excluded patients participating in Medicare Advantage Plans due to lack of complete claims data. We examined the racial and ethnic disparities by comparing Whites to non-Hispanic Blacks (Blacks) and Whites to Hispanics. We excluded other racial/ethnic groups due to small sample size. We only included patients with medication utilization issues because we intended to compare the "effectiveness" of MMA and ACA MTM eligibility criteria in identifying patients with these issues. We determined medication utilization issues by using medication safety/adherence measures developed primarily by the Pharmacy Quality Alliance (PQA).²³ Established in 2006 as a public-private partnership with CMS shortly after the implementation of the Part D benefit, PQA develops consensus-based measures for medication safety, adherence, and appropriate use. PQA measures are the main sources of medication utilization and quality measures for CMS Part D Star Ratings system, a quality evaluation system for Part D plans.²⁴

We included patients with any of the following medication utilization issues: (1) high-risk medication use in the elderly – patients had 2 fills for high-risk medication (such as skeletal muscle relaxants metaxalone, antithrombotics ticlopidine, cardiovascular agent guanfacine, and barbiturates); (2) inappropriate treatment of hypertension in persons with diabetes – a patient who was dispensed a medication for diabetes and hypertension has not received an angiotensin-converting-enzyme inhibitor, angiotensin II receptor blocker or direct renin inhibitor medication; (3) proportion of days covered (PDC), <80% for the following medication classes: renin-angiotensin system antagonists, cholesterol medications among adults with coronary artery disease, and oral diabetes medications (including biguanides, sulfonylureas, thiazolidinediones, and dipeptidyl peptidase-IV inhibitors), beta-blockers, calcium-channel blockers, and non-warfarin oral anticoagulants; (4) drug-drug interactions – examples were drug pairs atazanavir/lansoprazole, digoxin/clarithromycin, and ergonovine/ketoconazole; (5) excessive doses of oral diabetes medications – the dispensed dose exceeded the Food & Drug Administration-approved dosing; (6) PDC <90% for HIV antiretroviral medications; (7) chronic use (90 days) of atypical antipsychotics by elderly beneficiaries in nursing home; (8) antipsychotic use in persons with dementia.

MTM Eligibility Criteria

Because national MTM enrollment data were not available, we identified eligible individuals based on MTM eligibility criteria. To assess MMA MTM eligibility criteria comprehensively, three sets of MTM eligibility thresholds were analyzed: those used by Part D plans in 2009 and 2013, and those proposed for 2015. The 2009 and 2013 MTM criteria represented the most recent years available for pre-2010 and post-2010 respectively, at the time of this analysis.

We analyzed the minimum, median (the middle value of ordered numbers), mode (the most frequently occurring value), and maximum of the thresholds to represent variation in MMA eligibility thresholds used by Part D plans. We analyzed mode values in the main analysis and other values in the sensitivity analyses. For example, MTM eligibility thresholds in 2009 had the following pattern: 2–15 Part D medications (median=6 and mode=8, so four representative values including minimum and maximum), 2–5 chronic conditions (both median and mode=3, so three representative values including minimum and maximum), and \$4,000 in annual medication costs.⁵ Because an individual must meet all three criteria to be eligible, we examined $12=4*3*1$ different combinations of representative thresholds, where 4, 3, and 1 are the number of unique representative thresholds for each eligibility criterion. Applying the same strategy, assessment of 2013 MMA MTM thresholds examined 4 combinations. There was only one combination of 2015 eligibility criteria.

When calculating the number of medications and medication costs, we used information directly available in Medicare data.¹⁹ When determining the number of chronic conditions, we calculated a count of medical conditions based on a list of 25 chronic conditions.²⁵ We adjusted the medication cost thresholds for inflation based on the consumer price index for the study year.²⁶ For the ACA eligibility criterion related to high-risk medications, we applied a list developed by PQA measures due to its wide adoption, as ACA did not specify

a list of high-risk medications.²³ For the criterion “transition of care,” we determined the eligibility based on patients’ utilization of various health services.²⁷

Statistical analysis

For the descriptive analysis, we first used McNemar’s chi-square test to compare MMA and ACA MTM eligibility criteria on proportions of patients eligible for MTM. We then used a Cochran-Mantel-Haenszel test to compare these two sets of criteria on proportions of eligible patients across racial/ethnic groups. Furthermore, we used multinomial logistic regression to control for patient/community characteristics. The potential study outcomes for this regression included the following categories:

$$Y = \begin{cases} 1 = \text{Not meeting either MMA or ACA MTM eligibility criteria;} \\ 2 = \text{Meeting MTM eligibility criteria in ACA but not under MMA;} \\ 3 = \text{Meeting MTM eligibility criteria under MMA but not in ACA;} \\ 4 = \text{Meeting both the MTM eligibility criteria under ACA and MMA.} \end{cases}$$

We used category 2 as the reference group because the comparison between categories 2 and 4 allowed the determination of comparative effectiveness of MMA and ACA MTM eligibility criteria. Although it would be easier to interpret findings by comparing categories 2 and 3, no patient was found in category 3 because ACA criteria are less restrictive than MMA criteria. Predicted probabilities were calculated for all outcome categories across racial/ethnic minorities. Difference in predicted probabilities for categories 2 and 4 between whites and minority groups were then calculated. If this difference is positive for Blacks in the calculation (category 2 minus category 4), for instance, that would indicate higher comparative effectiveness for ACA criteria than MMA criteria for Blacks compared to Whites.

We applied need-based and demand-based analysis strategies to determine whether differences across racial/ethnic groups reflect differences in the need for healthcare or differences in healthcare demand.²⁸ In need-based analysis, we included factors affecting individuals’ need for healthcare, such as age, gender, Deyo-adapted Charlson Comorbidity Index, and risk adjustment summary score. For demand-based analysis, we included factors that might affect healthcare demands (all covariates).

We conducted disease-specific analyses for each of the top ten MTM-targeted chronic conditions to produce policy recommendations applicable to patients with specific conditions.^{5,6} These include diabetes, cardiac disease, dyslipidemia, hypertension, asthma, depression, chronic obstructive pulmonary disease, osteoporosis, rheumatoid arthritis, and renal disease. Data analysis was conducted using SAS[®]9.4 (SAS Institute Inc, Cary, NC) and STATA[®]13.1 (STATA Corporation, College Stations, TX). The statistical significance level was set *a priori* at 0.05. The study was approved by the Institutional Review Board at the corresponding author’s institution (approval number: 13–02788-XM).

Results

The sample included 964,610 Medicare beneficiaries with medication utilization issues, representing 43.6% of the 2,213,594 individuals who met other inclusion criteria regardless of medication utilization issues. The majority of the sample, 880,267 (91.3%) were White, while 53,273 (5.5%) were Black and 31,070 (3.2%) were Hispanic. As we previously reported, higher proportions of Blacks and Hispanics (55.0%, and 48.8% respectively) had medication utilization issues than Whites (42.9%).¹² Distribution of medication utilization issues across racial/ethnic groups is shown in Table S1 of the Supplemental Materials. The differences between Whites and minorities were significant for most characteristics (Table 1). For example, compared with Whites, minorities resided in counties with higher percentages of individuals in poverty, and minorities were more likely to have higher Deyo-adapted Charlson Comorbidity Index.

According to descriptive analysis, higher proportions of patients with medication utilization issues would be eligible for MTM based on ACA than MMA MTM eligibility criteria, indicating that ACA criteria would be more effective than MMA criteria in identifying patients with medication utilization issues. For instance, based on the main analysis, proportions of eligible individuals under ACA and 2013 MMA MTM eligibility thresholds would be 99.7% and 26.2% respectively ($P<0.001$). A similar pattern was found for all other main and sensitivity analyses for other eligibility thresholds.

MMA MTM eligibility criteria were associated with higher racial and ethnic disparities in proportions of population eligible for MTM than ACA criteria (Table 2). For instance, based on the main analysis for 2013 MTM eligibility criteria, racial and ethnic disparities were 3.2% and 3.0%, respectively. However, racial and ethnic disparities associated with ACA MTM eligibility criteria in this analysis were only 0.2% and 0.3%, respectively. The differences between ACA and MMA criteria were significant ($P<0.05$). We found similar patterns for all other main and sensitivity analyses (Table 2).

These findings were also confirmed by multinomial logistic regression. For example, the demand-based main analysis for the comparison between ACA and 2013 MMA were depicted in Figure 1. The difference in predicted probabilities for categories 2 and 4 between Blacks and Hispanics were 13.6% and 9.8%, respectively. This indicates that ACA criteria would be 13.6% more effective among Blacks (in relation to Whites) compared to MMA criteria. Similarly, ACA MTM eligibility criteria would be 9.8% more effective among Hispanics (in relation to Whites) compared to MMA criteria. Need-based and demand-based analyses produced similar patterns (Figure 1). Note that differences across racial/ethnic groups based on multivariate analyses were greater than those in descriptive analyses. Numbers used to produce Figure 1 are reported in Table S2 of the Supplemental Materials. Other main/sensitivity analyses produced similar findings.

Discussion

The study examined the comparative effectiveness of the MTM eligibility criteria under MMA versus ACA in identifying older patients (≥ 65 years of age) with medication

utilization issues across racial/ethnic groups. In general, ACA MTM eligibility criteria are more effective in identifying patients with medication utilization issues than MMA criteria. ACA MTM eligibility criteria were also more comparatively effective than MMA criteria among Blacks and Hispanics as compared to Whites. These patterns hold based on both need-based and demand-based analyses. Therefore, these differences across racial/ethnic groups reflect both need and demand for healthcare.

MTM services possess established benefits in managing patients' medication utilization issues and disease states in a cost-effective manner.²⁻⁴ Greater MTM access among older patients with medication utilization issues, as provided under ACA criteria, may in turn improve health outcomes and reduce healthcare costs. Because of higher prevalence and worse outcomes of some chronic conditions targeted by MTM (such as hypertension and diabetes) among racial/ethnic minorities, the ACA MTM eligibility criteria have the potential to address/reduce these disparities.⁹⁻¹¹

The greater effectiveness of ACA MTM eligibility criteria is likely attributable to their less restrictive nature compared to MMA criteria. Comparative effectiveness among older minorities versus older Whites is higher with ACA than MMA MTM eligibility criteria because minorities tend to have higher rates of specific common chronic disease states and a greater number of medication utilization issues compared to Whites.⁹⁻¹¹ Therefore, logic would dictate that minorities are more likely than Whites to meet at least one of ACA's eligibility criteria. Our findings are consistent with previous studies that indicate that MMA MTM eligibility criteria perpetuate structural racial/ethnic disparities in access to health services.¹²⁻¹⁴

Although the current study provides evidence of the potential utility of the ACA MTM eligibility criteria in reducing racial/ethnic disparities in access to MTM among older individuals with medication utilization issues, the timeline for the implementation of ACA MTM eligibility criteria is uncertain. Further, a previous study reported that there would still be significant ethnic disparities in meeting ACA MTM eligibility criteria although racial disparities in eligibility were not significant.¹⁴ Additionally, efficiency is also an important aspect of the performance of MTM eligibility criteria in addition to effectiveness and equity. In the setting of MTM eligibility criteria, efficiency may be evaluated by proportion of patients having medication utilization issues among individuals who are MTM-eligible. Higher values of such proportions indicate that patients targeted have higher likelihood of having medication utilization issues. Lee et al. pointed out that a 1% increase in the efficiency among those identified for MTM services could potentially translate to considerable cost savings for health plans due to the large size of the target population.²⁹ A recent study reported that MMA MTM eligibility criteria possess higher efficiency than ACA criteria.¹²

Given the limitation of both ACA and MMA MTM eligibility criteria, alternative MTM eligibility criteria are needed. One such possible alternative that can potentially alleviate disparity issues is to deem MTM eligibility by identifying medication utilization issues using quality measures in CMS Part D Star Ratings.¹² Such a strategy may eliminate racial/ethnic disparities in MTM eligibility due to the higher prevalence of medication utilization

issues among minorities than Whites.^{9–11} The challenge may be that this approach requires the development/implementation of complex algorithms to identify medication utilization issues, and standardization of these algorithms across health plans. However, Part D plans already have systems to identify medication utilization issues for Part D Star Ratings.

The most significant strength of our study is external validity due to the analysis of a national population of older adults. The primary limitation is that, due to our analyses of policy scenarios instead of MTM enrollment data, results need to be confirmed with the actual MTM records when these become available. Second, to identify patients with medication utilization issues, we used widely accepted medication safety/adherence measures, which may not include measures for all medication utilization issues. Third, due to multiple inclusion criteria, racial/ethnic composition of the study sample is not typical of Medicare beneficiaries with proportion of Whites over 90% although significant number of minorities were also included; we did not analyze some racial/ethnic groups due to small sample size. Fourth, we used the Research Triangle Institute race code for race/ethnicity information. Although this code represents improvement compared to traditional race code in Medicare data, it still has suboptimal sensitivity/specificity.³⁰

In conclusion, the ACA MTM eligibility criteria would be more effective than MMA criteria in identifying older individuals with medication utilization issues. ACA MTM eligibility criteria also would be more effective than MMA criteria among older racial/ethnic minorities in comparison to older Whites in identifying individuals with medication utilization issues. This is critical information to consider when modifying Medicare MTM eligibility criteria.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Funding

Research reported in this publication was supported by the National Institute on Aging of the National Institutes of Health under Award Number R01AG049696. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Sponsor's Role: Research reported in this publication was supported by the National Institute on Aging of the National Institutes of Health under award number R01AG049696. The content of this study is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

References

1. Centers for Medicare and Medicaid Services (CMS), Department of Health and Human Services. Medicare program; Medicare Prescription Drug Benefit. Final rule. Fed Regist 2005;70:4193–4585. [PubMed: 15678603]
2. American Pharmacists Association and National Association of Chain Drug Stores Foundation. Medication therapy management in community pharmacy practice: Core elements of an MTM service (Version 1.0). J Am Pharm Assoc (2003) 2005;45:573–579. [PubMed: 16295642]

3. Acumen & Westat. Medication Therapy Management in Chronically Ill Populations: final report (online). Available at: https://innovation.cms.gov/files/reports/mtm_final_report.pdf. Accessed July 12, 2018.
4. Fera T, Bluml BM, Ellis WM. Diabetes Ten City Challenge: final economic and clinical results. *J Am Pharm Assoc* (2003) 2009;49:383–391. Doi:10.1331/JAPhA.2009.09015. [PubMed: 19357068]
5. Centers for Medicare and Medicaid Services (CMS), Department of Health and Human Services. Medicare Part D Medication Therapy Management (MTM) Programs 2009 Fact Sheet (online). Available at: https://www.cms.gov/Medicare/Prescription-Drug-Coverage/PrescriptionDrugCovContra/downloads/MTMFactSheet_2009_06-2009_fnl.pdf. Accessed July 12, 2018.
6. Centers for Medicare and Medicaid Services (CMS), Department of Health and Human Services. Medicare program; Contract year 2015 policy and technical changes to the Medicare Advantage and the Medicare Prescription Medication Benefit programs. Proposed rule. *Fed Regist* 2014;79:1917–2073.
7. Centers for Medicare and Medicaid Services (CMS), Department of Health and Human Services. CMS letter to Congress on proposed Medicare Advantage & Part D rule (online). Available at: <https://kaiserhealthnews.files.wordpress.com/2014/03/tavener-part-d.pdf>. Accessed July 12, 2018.
8. Stuart B, Loh E, Miller L, Roberto P. Should eligibility for medication therapy management be based on drug adherence? *J Manag Care Pharm* 2014;20:66–75. [PubMed: 24511767]
9. Byrd L, Fletcher A, Menifield C. Disparities in health care: minority elders at risk. *ABNF J* 2007;18:51–55. [PubMed: 17608287]
10. Tran HV, Waring ME, McManus DD, et al. Underuse of effective cardiac medication among women, middle-aged adults, and racial/ethnic minorities with coronary artery disease (from the National Health and Nutrition Examination Survey 2005 to 2014). *Am J Cardiol* 2017;120:1223–1229. [PubMed: 28822562]
11. Roth MT, Esserman DA, Ivey JI, Weinberger M. Racial disparities in quality of medication use in older adults: findings from a longitudinal study. *Am J Geriatr Pharmacother* 2011;9:250–258. [PubMed: 21664193]
12. Spivey CA, Wang J, Qiao Y, et al. Racial and ethnic disparities in meeting MTM eligibility criteria based on Star Ratings compared with the Medicare Modernization Act. *J Manag Care Spec Pharm* 2018;24:97–107. [PubMed: 29384031]
13. Wang J, Qiao Y, Spivey CA, et al. Disparity implications of proposed 2015 Medicare eligibility criteria for medication therapy management services. *J Pharm Health Serv Res* 2016;7:209–215. [PubMed: 28025599]
14. Wang J, Qiao Y, Shih YCT, et al. Potential health implications of the MTM eligibility criteria in the Affordable Care Act across racial and ethnic groups. *J Manag Care Spec Pharm* 2015;21:993–1003. [PubMed: 26521111]
15. Briesacher B, Limcangco R, Gaskin D. Racial and ethnic disparities in prescription coverage and medication use. *Health Care Financ Rev* 2003;25:63–76. [PubMed: 15124378]
16. Schore J, Brown R, Lavin B. Racial disparities in prescription drug use among dually eligible beneficiaries. *Health Care Financ Rev* 2003;25:77–90. [PubMed: 15124379]
17. The Office of the Legislative Counsel. Compilation of Patient Protection and Affordable Care Act (online). Available at: <http://www.leahy.senate.gov/imo/media/doc/Affordable%20Care%20Act%20Full%20Text.pdf>. Accessed July 12, 2018.
18. Agarwal R, Gupta A, Fendrick AM. Value-Based insurance design improves medication adherence without an increase in total health care spending. *Health Aff (Millwood)*. 2018;37:1057–1064. Doi:10.1377/hlthaff.2017.1633. [PubMed: 29985690]
19. Research Data Assistance Center. Find a CMS Data File (online). Available at: <https://www.resdac.org/cms-data>. Accessed July 12, 2018.
20. Health Resources and Services Administration (HRSA). Area Health Resources Files (online). Available at: <https://datawarehouse.hrsa.gov/topics/ahrf.aspx>. Accessed July 12, 2018.
21. Gelberg L, Andersen RM, Leake BD. The Behavioral Model for Vulnerable Populations: application to medical care use and outcomes for homeless people. *Health Serv Res* 2000;34:1273–1302. [PubMed: 10654830]

22. Centers for Medicare and Medicaid Services (CMS), Department of Health and Human Services. Risk Adjustment (online). Available at: <https://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/Risk-Adjustors.html>. Accessed July 12, 2018.
23. Pharmacy Quality Alliance. Technical Specifications for PQA Approved Measures. 2013.
24. Centers for Medicare and Medicaid Services (CMS), Department of Health and Human Services. Part C and D Performance Data (online). Available at: <https://www.cms.gov/Medicare/Prescription-Drug-coverage/PrescriptionDrugCovGenIn/PerformanceData.html>. Accessed July 12, 2018.
25. Daniel GW, Malone DC. Characteristics of older adults who meet the annual prescription medication expenditure threshold for Medicare medication therapy management programs. *J Manag Care Pharm* 2007;13:142–154. [PubMed: 17330975]
26. Bureau of Labor Statistics. Consumer Price Index (online). Available at: <https://www.bls.gov/cpi/data.htm>. Accessed July 12, 2018.
27. Zuckerman IH, Langenberg P, Baumgarten M, et al. Inappropriate drug use and risk of transition to nursing homes among community-dwelling older adults. *Med Care* 2006;44:722–730. [PubMed: 16862033]
28. Escarce JJ, Kapur K. Racial and ethnic differences in public and private medical care expenditures among aged Medicare beneficiaries. *Milbank Q* 2003;81:249–275. [PubMed: 12841050]
29. Lee JS, Yang J, Stockl KM, Lew H, Solow BK. Evaluation of eligibility criteria used to identify patients for medication therapy management services: a retrospective cohort study in a Medicare Advantage Part D population. *J Manag Care Spec Pharm* 2016;22:22–30. Doi: 10.18553/jmcp.2016.22.1.22. [PubMed: 27015048]
30. Qiao Y, Spivey CA, Wang J et al. Higher predictive value positive for MMA than ACA MTM eligibility criteria among racial and ethnic minorities: an observational study. *Inquiry*. 2018;55:46958018795749. doi: 10.1177/0046958018795749. [PubMed: 30175638]

Impact Statement

We certify that this work is novel. Previous literature reported that the eligibility criteria for medication therapy management (MTM) services in Medicare prescription drug (Part D) under Medicare Modernization Act (MMA) were associated with effectiveness and equity issues. We found in this study that the MTM eligibility criteria in the Affordable Care Act would be comparatively more effective than those under MMA in identifying individuals with medication utilization issues among racial/ethnic minorities than non-Hispanic Whites.

Figure 1: Difference in Predicted Probabilities of Eligibility for Medication Therapy Management across Racial and Ethnic Groups

CI: Confidence Interval

* $P < 0.05$ for racial/ethnic disparities between category 2 (meeting MTM eligibility criteria in ACA but not under MMA) vs. category 4 (meeting both the MTM eligibility criteria under ACA and MMA)

Table 1.**Patient and Community Characteristics across Racial and Ethnic Groups**

Variables	Non-Hispanic Whites (N=880,267)		Non-Hispanic Blacks (N=53,273)		Hispanics (N=31,070)	
	n	%	n	%	n	%
Predisposing Factors						
Age		76.9±7.2		75.7±6.8		75.9±6.6
Male	347,538	39.5%	18,554	34.8%	13,145	42.3%
% of non-White population ^δ		22.4%±15.1%		39.5%±16.7%		30.6%±14.3%
% of married-couple families ^δ		77.7%±5.9%		70.7%±8.4%		73.7%±6.8%
Per capita income ^{*,δ}	43,895.1±11,928.9		43,888.2±12,138.6		43,484.4±13,488.0	
% in poverty ^δ		15.6%±5.3%		18.5%±6.3%		17.7%±6.1%
% eligible for Medicaid ^δ		19.5%±7.6%		22.8%±8.5%		23.6%±1.0%
% unemployed population ^δ		7.5%±2.1%		8.2%±2.0%		8.6%±3.2%
% without health insurance ^δ		13.5%±4.1%		15.0%±3.6%		18.0%±5.9%
% of education level for persons 25+ years old ^δ						
< High school diploma		13.7%±5.4%		15.6%±5.3%		18.6%±8.0%
High school diploma		86.5%±5.4%		84.5%±5.3%		81.5%±8.0%
4-year college degree		26.9%±10.5%		27.9%±10.5%		27.7%±10.1%
Enabling Factors						
Metropolitan statistical area ^δ	658,013	74.8%	44,341	83.2%	27,039	87.0%
Health professional shortage area ^δ	770,879	87.6%	48,646	91.3%	28,542	91.9%
Region						
Northeast	153,488	17.4%	8,983	16.9%	4,645	15.0%
Midwest	230,958	26.2%	8,986	16.9%	3,445	11.1%
South	358,482	40.7%	32,472	61.0%	10,242	33.0%
West	136,531	15.5%	2,356	4.4%	9,875	31.8%
Other	808	0.1%	476	0.9%	2,863	9.2%
Need Factors						
Charlson comorbidity index		2.4±2.4		2.9±2.6		2.7±2.5
Risk adjustment summary score [*]		0.9±0.7		0.9±0.8		0.9±0.7

* $P > 0.05$ for the difference between non-Hispanic Whites and non-Hispanic Blacks. $P < 0.05$ for the difference between non-Hispanic Whites and minorities for all other variables.

^δ Community characteristics,

Mean ± Standard Deviation are reported unless otherwise specified.

Table 2.

Proportions Meeting Eligibility Criteria for Medication Therapy Management (MTM) services across Racial and Ethnic Groups

Analyses	Combinations of MTM Eligibility Criteria	Whites	Blacks	Hispanics	Racial Disparities	Ethnic Disparities
2009 MTM Eligibility Thresholds under MMA (Drug Cost Threshold=\$4,000)						
Main analysis	8 drugs & 3 conditions	15.6%	13.8%	13.5%	1.8%	2.1%
Sensitivity 1	2 drugs & 2 conditions	16.6%	14.8%	14.5%	1.8%	2.1%
Sensitivity 2	2 drugs & 3 conditions	16.4%	14.7%	14.4%	1.7%	2.0%
Sensitivity 3	2 drugs & 5 conditions	15.1%	13.6%	13.2%	1.5%	1.9%
Sensitivity 4	6 drugs & 2 conditions	16.4%	14.6%	14.3%	1.8%	2.1%
Sensitivity 5	6 drugs & 3 conditions	16.2%	14.5%	14.2%	1.7%	2.0%
Sensitivity 6	6 drugs & 5 conditions	15.0%	13.4%	13.0%	1.6%	2.0%
Sensitivity 7	8 drugs & 2 conditions	15.7%	13.8%	13.7%	1.9%	2.0%
Sensitivity 8	8 drugs & 5 conditions	14.5%	12.9%	12.6%	1.6%	1.9%
Sensitivity 9	15 drugs & 2 conditions	8.8%	7.3%	7.4%	1.5%	1.4%
Sensitivity 10	15 drugs & 3 conditions	8.8%	7.3%	7.4%	1.5%	1.4%
Sensitivity 11	15 drugs & 5 conditions	8.6%	7.2%	7.3%	1.4%	1.3%
2013 MTM Eligibility Thresholds under MMA (Drug Cost Threshold=\$3,144.25)						
Main analysis	8 drugs & 3 conditions	26.5%	23.3%	23.5%	3.2%	3.0%
Sensitivity 1	2 drugs & 2 conditions	29.2%	26.0%	26.1%	3.2%	3.1%
Sensitivity 2	2 drugs & 3 conditions	28.8%	25.8%	25.8%	3.0%	3.0%
Sensitivity 3	8 drugs & 2 conditions	26.7%	23.4%	23.7%	3.3%	3.0%
Proposed 2015 MTM Eligibility Thresholds under MMA (Drug Cost Threshold=\$620)						
Main analysis	2 drugs & 2 conditions	78.3%	75.0%	73.7%	3.3%	4.6%
MTM Eligibility Criteria under ACA						
Main analysis		99.7%	99.5%	99.4%	0.2%	0.3%

Whites: Non-Hispanic Whites; Blacks: Non-Hispanic Blacks; MMA: Medicare Modernization Act; ACA: Affordable Care Act

* $P < 0.05$ for the difference between non-Hispanic Whites and minorities for all analyses.