



Published in final edited form as:

Res Social Adm Pharm. 2013 ; 9(6): . doi:10.1016/j.sapharm.2012.09.003.

Historical Trend of Disparity Implications of Medicare MTM Eligibility Criteria

Junling Wang, Ph.D. [Associate Professor] and Yanru Qiao, M.S. [Research Assistant]
College of Pharmacy, University of Tennessee Health Science Center, Memphis, TN

Abstract

Background—Non-Hispanic Blacks (Blacks) and Hispanics have a lower likelihood of being eligible for medication therapy management (MTM) services than do non-Hispanic Whites (Whites) based on Medicare MTM eligibility criteria.

Objective—To determine whether MTM eligibility criteria would perform differently over time, this study examined the trend of MTM disparities from 1996–1997 to 2007–2008.

Methods—The study populations were Medicare beneficiaries from the Medical Expenditure Panel Survey. Proportions and the odds of MTM eligibility were compared between Whites and ethnic minorities. The trend of disparities was examined by including in logistic regression models interaction terms between dummy variables for the minority groups and 2007–2008. MTM eligibility thresholds for 2008 and 2010–2011 were analyzed. Main and sensitivity analyses were conducted to represent the entire range of the eligibility criteria.

Results—This study found no statistical significant racial or ethnic disparities associated with the MTM eligibility criteria for 2008 among the Medicare population during 1996–1997. However, racial disparities associated with 2010–2011 MTM eligibility criteria were significant according to multivariate analyses among the Medicare population during 1996–1997. During 2007–2008, both racial and ethnic disparities associated with both 2008 MTM eligibility criteria and 2010–2011 eligibility criteria were generally significant. Disparity patterns did not exhibit a statistically significant change from 1996–1997 to 2007–2008.

Conclusion—Racial and ethnic disparities in meeting MTM eligibility criteria may not decrease over time unless MTM eligibility criteria are changed.

Keywords

Health disparities; race; ethnicity; medication therapy management services; eligibility criteria; historical trend

INTRODUCTION

The importance of documenting racial and ethnic disparities and exploring solutions for these disparities has been widely and keenly recognized by policy makers and researchers.^{1,2}

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Correspondence: Junling Wang, Ph.D., College of Pharmacy, University of Tennessee Health Science Center, 881 Madison Avenue., Room 221, Memphis, TN 38163. Phone: 901-448-3601. Fax: 901-448-4731. jwang26@uthsc.edu.

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The nation has attempted to address racial and ethnic disparities in recent history. In the 1985 Report of the Secretary's Task Force on Black and Minority Health, the first comprehensive government report accounting for racial and ethnic disparities in health in the United States, policy makers rightly noted the “national paradox of phenomenal scientific achievement and steady improvement in overall health status” and coexisting “persistent, significant health inequalities [that] exist for minority Americans”.^{1,2} A new action plan to reduce racial and ethnic disparities recently released by the Department of Health and Human Services (HHS) was touted as the “most comprehensive federal commitment yet to reducing racial and ethnic health disparities”.² A major goal of this action plan was to increase the accountability of HHS for demonstrating progress in reducing disparities, specifically capitalizing on the provisions in the Affordable Care Act of 2010 that benefit diverse communities.²

Accompanied by the efforts by researchers and the U.S. government to reduce racial and ethnic health disparities is a discomfiting pattern that has aroused growing concern: as reported by the Agency for Healthcare Research & Quality,³ racial and ethnic minorities still lag behind majority non-Hispanic Whites (Whites) on many health and health care measures. Some disparity measures even indicate worsening disparities. The academic community has also reported such a pattern of persistent disparities.⁴⁻⁷ Perplexed by such phenomena, the research community and policy-makers have recently explored root causes for the more resistant disparities. For instance, Weinick and Hasnain-Wynia cautioned that quality improvement efforts should be devised carefully so that disparities can be reduced.⁸ Specifically, they suggested that quality improvement should not create perverse incentives lest providers avoid serving minority populations. Considering root causes of disparities from a wider perspective, Woolf and Braveman suggested that progress in narrowing health disparities can be achieved only by making modification to policies on community development, land use, housing, education, jobs, child care, and transportation.⁹

Medicare is the largest regulator and purchaser of health care in the U.S.¹⁰ Its policies are widely imitated, and it is well positioned to be a leader in reducing racial and ethnic disparities. Medicare's policy leverage was exemplified when hospitals desegregated in 1966 in order to receive Medicare reimbursement.¹⁰ Medicare Prescription Drug & Modernization Act (MMA) established Medicare prescription drug (Part D) benefit in 2006 which can positively impact racial and ethnic minorities due to many carefully crafted measures:¹¹ a low-income subsidy program was established by MMA to help qualified persons pay Part D premium and cost sharing; individuals dually eligible for Medicare and Medicaid were automatically enrolled in Part D and automatically received a low-income subsidy. Because minorities are more likely to have low income and be dually eligible than do Whites, these measures benefited minorities.

Medication therapy management (MTM) services are a relatively new type of benefit for certain Medicare beneficiaries. MTM services were added to the Medicare benefits package in 2006 when the Centers for Medicare & Medicaid Services (CMS) also required prescription drug plans for Medicare beneficiaries to offer MTM services for targeted individuals according to MMA.¹² MTM services are a distinct group of services to optimize therapeutic outcomes, and the core components of MTM services are the development of a medication treatment plan and the integration of medication management plan into all health services provided to patients.¹³ MTM services can improve patient therapeutic outcomes in a cost-effective manner, particularly for chronic disease management.¹⁴⁻¹⁶

According to the MMA, Part D plans are required to offer MTM services to only Medicare Part D beneficiaries who meet the eligibility criteria of multiple chronic conditions, multiple covered medications, and are likely to incur annual drug costs that exceed a certain

threshold.¹² The eligibility criteria for MTM services are flexible, and Part D plans can determine their own MTM eligibility thresholds within the legislative framework.¹² In regulations for Part D plans for 2010–2011, CMS stipulated that the MTM eligibility thresholds cannot be higher than eight Part D drugs, three chronic conditions, and \$3,000 in drug costs.¹⁷

The establishment of MTM services in Medicare presented a historical opportunity to reduce racial and ethnic disparities related to chronic conditions, because some chronic conditions targeted by MTM programs, e.g., diabetes and hypertension, are more prevalent among minority elderly than among their White counterparts.¹⁸ However, Wang and colleagues recently found in analyses of historical data before Part D implementation, racial and ethnic minorities would be less likely than Whites to be eligible for MTM services.¹⁹ These findings should be expected because Medicare MTM eligibility criteria are predominantly utilization-based, and racial and ethnic minorities typically use fewer prescription medications and incur lower costs on prescription drugs than do Whites within the Medicare population.^{20,21}

This study aimed to examine the historical trend of disparity implications of Medicare MTM eligibility criteria from 1996–1997 to 2007–2008. The main goal of this analysis was to inform decision-makers whether or not the disparity implications of MTM eligibility criteria may decrease over time without modifying the MTM eligibility criteria.

METHODS

Data Source

This was a cross-sectional analysis of Medicare beneficiaries in a secondary database, Medical Expenditure Panel Survey (MEPS; 1996–1997 and 2007–2008).²² As a large-scale national federal survey, MEPS was started in 1996 by AHRQ. MEPS collects information from a nationally representative sample of families, individuals, their medical providers, and employers. Information on individuals includes sociodemographic characteristics, health status, chronic conditions, access to care, satisfaction with care, utilization of health services and prescription medications and their costs, and sources of payment for these costs. MEPS also surveys medical providers including hospitals, physicians, home health care providers, and pharmacies identified by individual survey respondents. These sources serve a data quality improvement purpose because information from medical providers is used to supplement or replace information collected from survey respondents. MEPS uses an overlapping panel design whereby a new panel (group) of patients is added to the survey population every year, and each panel of individuals is surveyed in several rounds to cover 2 full calendar years.²² The response rates to MEPS survey were 77.7%, 66.4%, 56.9%, and 59.3% for 1996, 1997, 2007, and 2008, respectively.²² The response rates among Medicare populations were not reported in MEPS.

The most recent complete data were from 2008 at the time of this analysis. This study used data from 1996–1997 and 2007–2008. Data from 2 years were combined to represent each time period to achieve adequate statistical power. Additionally, 2-year periods instead of 1-year periods were compared to address statistical issues with using MEPS data for longitudinal analysis.²² Because of sampling variation from one year to the next in MEPS, some artificial statistically significant difference may result. The method of pooling multiple years has been suggested as one technique to address this concern.²² Information used in this study is freely available in downloadable data files.²²

Determining MTM Eligibility

When analyzing MTM eligibility criteria, we studied both 2008 thresholds and 2010–2011 thresholds to explore whether CMS strategies of lowering eligibility thresholds had a desirable effect of reducing or eliminating MTM disparities. This study accounted for the wide variation in eligibility thresholds by examining three representative values: the lower limit, median, and upper limit. For example, in 2008, these three values for the criterion based on the number of covered drugs were 2, 5, 15, respectively; the values for the criterion based on the number of chronic conditions were 2, 3, and 5, respectively; and the drug cost thresholds were \$4,000.²³ Because individuals must meet all three MTM eligibility criteria to be eligible, there were then $3 \times 3 \times 1 = 9$ different combinations of the thresholds to analyze, where the first and the second “3” represent the number of representative values for the criterion based on the number of covered drugs, and number of representative values for the criterion based on the number of chronic conditions, respectively, and the value “1” designates the only threshold on drug costs.¹² The combination for the medians (5 drugs, 3 chronic conditions) and \$4,000 in drug costs were analyzed in the main analysis, and all other eight combinations were analyzed in eight sensitivity analyses. When applying the thresholds of \$4,000 to 1996–1997 data, 2008 dollars were converted to dollars of the study years by using the consumer price index for medical care. Since the threshold for drug cost in 2007 was also \$4,000, the cost threshold of \$4000 was not converted for 2007.¹⁷

When analyzing the MTM eligibility thresholds for 2010–2011, similar methods were used as for the methods for 2008 eligibility thresholds. For 2010–2011, the representative values for the eligibility thresholds for the criterion based on the number of D drugs were 2 (lower limit), 5 (median), and 8 (upper limit), respectively.¹⁷ There were only two thresholds for the criterion on the number of chronic conditions: 2 and 3. The drug cost threshold was \$3,000. Therefore, there were $3 \times 2 \times 1 = 6$ combinations of thresholds for analysis for 2010–2011. The combination of 5 drugs, 3 chronic conditions, and \$3,000 in drug costs was analyzed in the main analysis. All other combinations were analyzed in the sensitivity analyses.

When counting the number of chronic conditions in MEPS, a raw count of chronic conditions among a list of 25 chronic conditions was used.²⁴ This list was devised by Daniel and Malone as chronic conditions applicable to Medicare beneficiaries when they studied the characteristics of individuals meeting MTM eligibility criteria. This list has included all major chronic conditions targeted in MTM programs.¹⁷

Theoretical Framework

Andersen's Behavioral Model in Health Services Utilization was used as the theoretical framework for including population characteristics in the regression models because MTM eligibility criteria are predominantly based on the utilization and costs of prescription medications.²⁵ Therefore, patient characteristics in the model included predisposing factors (age, gender, and marital status), enabling factors (highest degree received, income, insurance status, metropolitan statistical area, and geographic regions), and need factors (self-perceived health status).

Data Analyses

This study compared sociodemographic characteristics across racial and ethnic groups within the study population. The study samples from the earlier study period, 1996–1997, and the latter study periods, 2007–2008, were analyzed separately. Chi-square tests were used for all these comparisons.

This study examined racial and ethnic disparities in 1996–1997 and 2007–2008 and also compared the historical trend of racial and ethnic disparities from 1996–1997 to 2007–2008. When examining racial and ethnic disparities in 1996–1997 and 2007–2008, chi-square tests were used initially to compare proportions of individuals eligible for MTM between Whites and the two minority populations, Blacks and Hispanics. In a subsequent multivariate analysis, a logistic regression model was used to control for population sociodemographic and health-related characteristics. Specifically, patient characteristics in the model included predisposing factors (age, gender, and marital status), enabling factors (highest degree received, income, insurance status, metropolitan statistical area, and geographic regions), and need factors (self-perceived health status) according to Andersen's Behavioral Model in Health Services Utilization.²⁵ In the results, the odds ratios for the dummy variables for Blacks and Hispanics lower than 1 and statistically significant would suggest racial and ethnic disparities in meeting MTM eligibility criteria.

This study examined a trend of racial and ethnic disparities from 1996–1997 to 2007–2008 by analyzing racial and ethnic disparities with logistic regression covering data from both time periods and including interaction models between a dummy variable for the period 2007–2008 and dummy variables for the minority populations, Blacks and Hispanics. A positive and statistically significant interaction term between the period 2007–2008 and Blacks, for example, would suggest that disparities between Whites and Blacks decreased from 1996–1997 to 2007–2008.

All data analyses above took into account the complex survey design of MEPS, including primary sampling units, strata, and personal weights, by using the survey data analysis procedures in SAS 9.2. The statistical significance level was set a priori at 0.05. This study was deemed exempt by the IRB Office at the authors' institution.

RESULTS

Demographic Characteristics

During 1996–1997, within the study sample, there were 5,400 Whites (weighted to 61,276,507), 971 Blacks (weighted to 6,928,277) and 791 Hispanics (weighted to 3,807,299), representing 85.09%, 9.62%, 5.29% of the total population. During 2007–2008, there were 5,105 Whites (weighted to 70,176,231), 1,505 Blacks (weighted to 8,931,115), and 1,036 Hispanics (weighted to 6,516,431), representing 66.77%, 19.68%, and 13.55% of the total sample, respectively. Regarding sociodemographic characteristics (Table 1), higher proportions of Whites belonged to older age groups than did Blacks and Hispanics. Blacks and Hispanics had similar proportions of males to Whites. Whites had a higher proportion married than did Blacks and Hispanics. Whites had a lower proportion with Medicaid than did Blacks and Hispanics. Higher proportions of Whites than Blacks and Hispanics belonged to higher income categories and had higher educational degrees.

Higher proportions of Whites resided in the Midwest and South. Higher proportions of Blacks resided in the Midwest and South. Higher proportions of Hispanics resided in the South and West. Whites had lower proportions than did Blacks and Hispanics residing in metropolitan statistical areas (MSA). Higher proportions of Whites reported better categories of self-reported health status than did Blacks and Hispanics. All comparisons between Whites and the two minority populations, Blacks and Hispanics, were statistically significant except for gender and MSA ($P < 0.05$). For gender, neither the comparison between Whites and Blacks nor that between Whites and Hispanics was significant. For MSA, the comparison between Whites and Blacks was significant ($P < 0.05$), but the difference between Whites and Hispanics was not significant. The comparison between

Whites and the minority populations for the period 2007–2008 among the Medicare population was also similar to the findings above.

MTM Disparities during 1996–1997 among the Medicare Population

This study examined whether higher proportions of Whites met the eligibility criteria than did Blacks and Hispanics among the Medicare population in 1996–1997. Similar proportions of Whites, Blacks, and Hispanics met the eligibility criteria. For example, according to the main analysis for the 2008 eligibility criteria, the proportions meeting the eligibility criteria among Whites, Blacks, and Hispanics were 3.53%, 3.52%, and 3.42%, respectively (Table 2). The differences were not statistically significant between Whites and Blacks nor between Whites and Hispanics ($P>0.05$). The ranges of the proportions meeting MTM eligibility criteria according to the sensitivity analyses based on 2008 MTM eligibility criteria among Whites, Blacks, and Hispanics were 0.90%–3.80%, 0.70%–3.52%, and 0.90%–3.43%, respectively. The differences between Whites and Blacks were not significant nor were the differences between Whites and Hispanics. Results from multivariate analyses exhibited same pattern. The ranges for the adjusted odds ratios for Blacks to Whites and for Hispanics to Whites were 0.47–0.77 and 0.72–0.98, respectively ($P>0.05$ for all odds ratios).

The bivariate analysis based on the eligibility criteria in 2010–2011 found that the ranges of the proportions meeting MTM eligibility criteria according to the main and sensitivity analyses among Whites, Blacks, and Hispanics were 5.19%–7.42%, 3.66%–6.24%, and 5.43%–7.01%, respectively. The differences between Whites and Blacks and Whites and Hispanics were not significant. However, according to the multivariate analyses, Blacks were significantly less likely to be eligible for 2010–2011 MTM services than were Whites with odds ratios ranging from 0.50–0.66 ($P<0.05$); the differences between Whites and Hispanics were not significant according to the multivariate analyses (odds ratios ranged from 0.82–0.92). For example, according to the main analysis for 2010–2011 criteria (Table 3), the odds ratios for Blacks and Hispanics were 0.50 ($P<0.01$) and 0.87 ($P=0.54$), respectively. These odds ratios suggest that Blacks were only 50% as likely to be eligible for MTM services compared to Whites according to the 2010–2011 eligibility criteria.

Bivariate analyses also were conducted on racial and ethnic disparities in exceeding the thresholds for each MTM eligibility criterion among the Medicare population (Table 4). The only statistically significant difference was found in the proportions of exceeding the threshold of number of medications ≥ 2 between Whites and Blacks ($P<0.05$). The proportions of exceeding all other thresholds for each MTM eligibility criterion were not significant between Whites and Blacks nor between Whites and Hispanics.

MTM Disparities during 2007–2008

Besides the racial and ethnic disparities during the 1996–1997 periods, the patterns of racial and ethnic disparities during the 2007–2008 period were also studied. This study found that Whites generally had a higher likelihood of meeting MTM eligibility criteria than did Blacks and Hispanics based on both 2008 eligibility criteria and 2010–2011 eligibility criteria. According to the main analysis and sensitivity analyses 1–5 for the 2008 criteria, the adjusted odds ratios for Blacks to Whites ranged from 0.71–0.74 ($P<0.05$ for all odds ratios) and for Hispanics to Whites 0.61–0.70 ($P<0.05$ for all odds ratios). The adjusted odds ratios for Blacks to Whites and Hispanic to Whites according to sensitivity analyses 6–8 ranges from 0.66–0.76 ($P>0.05$) and 0.63–0.99 ($P>0.05$), respectively. According to 2010–2011 criteria, the adjusted odds ratios for Blacks to Whites ranged from 0.64–0.68 ($P<0.05$ for all odds ratios) and for Hispanics to Whites 0.56–0.61 ($P<0.05$ for all odds ratios).

Historical Trend of Disparities

This study examined the change in racial and ethnic disparities in meeting the MTM eligibility criteria from 1996–1997 to 2007–2008. This study found no significant change in disparity patterns between the two time periods. For example, according to the main analysis based on 2008 eligibility criteria, in the unadjusted analysis, the parameter estimates for the interaction terms between 2007–2008 and the dummy variables for Blacks and Hispanics were -0.07 (standard error 0.27; $P=0.79$) and -0.08 (standard error 0.28; $P=0.77$), respectively. According to the multivariate analysis, the parameter estimates for the interaction terms between the period of 2007–2008 and the dummy variables for Blacks and Hispanics were 0.04 (standard error 0.28; $P=0.89$) and -0.10 (standard error 0.29; $P=0.73$), respectively (Table 5). The patterns were similar based on the analyses for 2010–2011 MTM eligibility criteria.

DISCUSSION

Analyzing a national sample from a federal survey representative of the non-institutionalized civilian population, this study found persistent disparities associated with 2008 and 2010–2011 MTM eligibility criteria from 1996–1997 to 2007–2008 among the Medicare population. Because MTM eligibility criteria are based mainly on the utilization of prescription medications, these findings are in keeping with the previous literature that documented lower utilization of prescription medications among Blacks and Hispanics than among Whites.^{6,7,20,21}

Racial and ethnic disparities in the use of prescription drugs and health services are caused by complicated factors. These factors may include differences across racial and ethnic groups in literacy levels, socioeconomic characteristics, knowledge about disease management, cultural traditions, trust in the health care system, and system and provider-level problems.²¹ Regardless, utilization-based eligibility criteria can lead to disparities in meeting them across racial and ethnic groups.

MTM services are value-based strategies because persons meeting the MTM eligibility criteria have more complicated health issues and medication regimens and are more likely to benefit from MTM services.²⁶ Because considering value is imperative given current resource challenges, value-based strategies inevitably will be more prevalent in the United States in the future.

The study findings of no significant reduction associated with either 2008 or 2010–2011 MTM eligibility criteria among the Medicare population are consistent with previous government reports of lack of progress on disparity reduction or elimination. For example, the 2010 National Healthcare Quality Report and the National Healthcare Disparities Report mandated by the U.S. Congress emphasized the need to special attention to equitable health care: although health care quality was improving, few disparities in measures for quality of care were getting smaller and almost no disparities in measures for access to care were getting smaller.³ Specifically, fewer than 20% of disparities in health care quality faced by Blacks, Hispanics, American Indians and Alaska Natives, and the poor exhibited narrowing trend. Additionally, according to the final review of Healthy People 2010, when evaluating changes in overall health disparities by race and ethnicity over time, no change (defined as less than 10 percentage points) in health disparities was found for 111 (69%) of the 169 objectives included in the evaluation.²⁷ The disparities decreased for only 27 objectives among the 169 objectives included in the evaluation.

The academic community has also documented the lack of progress on disparity reduction or elimination.^{4–7} For example, depression is a major cause of morbidity in late life, and

antidepressants have been demonstrated to be effective in reducing depression symptoms among the elderly. However, when Blazer and colleagues studied the association of race to the use of antidepressants between 1986 and 1996 using a stratified probability-based sample of 4,162 senior adults in the Piedmont region of North Carolina, they reported that elderly African-Americans were less likely to take antidepressants than were elderly Whites. They also found that the difference between them increased over the 10 years of the study period.⁵ In another study, Blazer and colleagues reported similar findings when examining the time intervals from 1986–1987 to 1989–1990 (interval 1) and from 1992–1993 to 1996–1997 (interval 2).⁴

Because minorities are less likely to be eligible for MTM services than are Whites and MTM services can improve patient health outcomes, MTM eligibility criteria may actually aggravate existing racial and ethnic disparities in health outcomes. Additionally, because MTM services can reduce downstream healthcare costs as a result of the improvement of patient health outcomes, while it is a value-based strategy to use MTM eligibility criteria instead of providing MTM services to all patients, disparities associated with MTM services may come with a price tag.

Although it is hard to specify the price tag for disparity implications associated with MTM services without well-thought through research studies, the economic impact of racial and ethnic disparities has been explored particularly in recent years. The study by LaVeist, Gaskin, and Richard estimated that eliminating racial and ethnic disparities would have reduced direct medical costs by approximately \$230 billion (in 2008 dollars) and indirect costs associated with morbidity and mortality by over \$1 trillion (in 2008 dollars) for 2003–2006 at the national level.²⁸ The state of Colorado estimated the cost of health disparities in Colorado that was born by taxpayers:²⁹ eliminating disparities could result in cost savings of \$80 million annually in diabetes care, \$40 million annually in health care related to obesity, and \$7.6 million annually in HIV/AIDS care. Waidmann estimated that in 2009, racial and ethnic disparities in diabetes, hypertension, stroke, and renal disease among Blacks, Hispanics, and Whites would cost the health care system \$23.9 billion.³⁰ The extra burden of morbidity and mortality due to disparities may hurt the bottom lines of the business community as well. Specifically, employers need to spend extra health care dollars and incur extra indirect costs because of absenteeism and compromised work productivity (presenteesim).³¹

This study has strengths. First, this study makes an important contribution to the literature by exploring the MTM disparity patterns in 1996–1997 and 2007–2008 and examining the historical trend of racial and ethnic disparities in meeting MTM eligibility criteria. This study dispels false hopes that the MTM disparities may be reduced or eliminated over time without any proactive actions from the government. Additionally, by using a federal survey at the national level, the study findings are nationally generalizable. Furthermore, MEPS is a quality database for prescription drug use research thanks to measures taken to improve the accuracy of prescription drug use data by collecting information directly from pharmacies.²²

This study has limitations to consider when interpreting the results. For one, policy scenarios were utilized rather than “real-world” data. An attractive alternative strategy for answering this timely research question is to analyze the actual enrollment in MTM services across racial and ethnic groups. However, information on patient-level enrollment is not currently available at the national level and is not expected to be in the near future. MTM services are paid by Part D plans out of administrative funds, and Part D plans are not required to submit MTM claims to CMS.¹² Additionally, MTM claims databases available through some MTM service companies do not include racial and ethnic information. Even if MTM claims databases contain racial and ethnic characteristics of patients, the MTM service companies

and Part D plans are not necessarily willing to share the data because racial and ethnic disparity is a sensitive topic and may bring negative press exposure. However, waiting to answer the important questions of MTM disparities until a perfect data source becomes available would deprive policy makers of timely and valuable information that can assist them to better balance equity and efficiency in policy making. Furthermore, the consistency of this study with previous studies on MTM disparities and historical literature and government reports on the persistency of racial and ethnic disparities testifies to the reliability of the findings from this study.³⁻⁷

This study included all prescription medications in calculating MTM eligibility, but not just medications covered by health plans. This was a necessary compromise because it is impossible to pinpoint the inclusion of every medication in the diverse formularies of health plans.¹² Nonetheless, because of the repeated documentation of racial and ethnic disparities in the use and costs of prescription medications, it is hard to imagine that a more detailed analysis would produce differential disparity patterns.^{6,7,20,21,32, 33} Additionally, because minorities may be equally or less likely to enroll in Medicare Part D compared to Whites,^{34,35} as far as selection bias is concerned, this study may have underestimated the disparity issues among the minority population than Whites. However, because this study found evidence of disparities, the selection bias issue should not be a major concern. The final study limitation lies in the use of survey data that is prone to issues such as recall error and data entry and processing error.

CONCLUSION

In summary, this study found persistent disparities associated with 2008 and 2010–2011 MTM eligibility criteria from 1996–1997 to 2007–2008 among the Medicare population. Racial and ethnic disparities in meeting MTM eligibility criteria may not decrease over time unless Medicare MTM eligibility criteria are changed.

Acknowledgments

The project was supported by Pharmaceutical Research and Manufacturers of America (PhRMA) Foundation Research Starter Grant in Health Outcomes and Grant Number R01AG040146 from the National Institute On Aging. The content is solely the responsibility of the authors and does not necessarily represent the official views of the PhRMA Foundation, the National Institute On Aging or the National Institutes of Health.

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Table 1
Sociodemographic characteristics across racial and ethnic groups among the Medicare population in 1996–1997.

Variables	Groups	Non-Hispanic Whites		Non-Hispanic Blacks		Hispanics	
		No.	%	No.	%	No.	%
Age ^{a,b}	<65	590	9.23	219	24.26	142	17.69
	65–74	2,502	49.50	435	45.96	387	52.80
	75–84	1,712	32.85	226	23.53	185	23.30
	>85	452	8.41	64	6.25	61	6.20
Gender	Female	3,151	56.63	604	58.29	474	57.78
	Male	2,318	43.37	379	41.71	328	42.22
Marital Status ^{a,b}	Not Married	2,487	43.98	649	65.87	431	53.76
	Married	2,913	56.02	322	34.13	360	46.24
Private							
Insurance ^{a,b}	No	1,906	32.03	662	64.24	586	68.54
	Yes	3,563	67.97	321	35.76	216	31.46
Medicaid ^{a,b}	No	4,930	92.38	623	67.24	461	60.50
	Yes	539	7.62	360	32.76	341	39.50
Poverty	Poor	901	11.72	359	31.90	246	28.09
Categories ^{a,b}	Near poor	379	6.83	112	11.50	99	12.62
	Low income	1,038	20.56	187	20.90	161	19.28
	Middle income	1,599	34.86	197	23.17	195	26.18
	High income	1,552	26.04	128	12.53	101	13.84
Highest Degree ^{a,b}	Lower than high school	2,023	36.31	561	56.59	528	63.00
	GED or High School	2,438	46.18	285	32.17	173	24.52
	Bachelor	427	8.07	37	5.28	41	8.40
	Master and higher	277	5.54	33	3.33	21	3.42
	Other	209	3.90	24	2.63	4	0.67
Region ^{a,b}	Northeast	1,166	21.41	182	18.16	130	15.96
	Midwest	1,403	26.32	191	20.56	48	5.96

Variables	Groups	Non-Hispanic Whites		Non-Hispanic Blacks		Hispanics	
		No.	%	No.	%	No.	%
	South	1,676	34.02	491	51.02	335	43.12
	West	1,011	18.25	80	10.27	262	34.96
Metropolitan	No	1,586	25.48	199	19.66	108	9.10
Statistical Area ^b	Yes	3,671	74.52	745	80.34	667	90.90
Self-perceived	Excellent	808	16.55	106	10.74	89	12.53
Health Status ^{a,b}	Very Good	1,361	26.63	174	20.08	129	20.71
	Good	1,575	30.05	267	27.72	227	28.55
	Fair	949	17.57	267	29.14	203	24.61
	Poor	533	9.19	119	12.33	118	13.59

^a $P < 0.05$ for the difference between non-Hispanic Whites (Whites) and non-Hispanic Blacks (Blacks);

^b $P < 0.05$ for the difference between Whites and Hispanics.

Table 2

Numbers and proportions of individuals across racial and ethnic groups that would be eligible for MTM services in 1996–1997 according to 2008 eligibility criteria.

Analyses	Number of Part D Drugs	Number of Chronic Conditions	Groups	Number Eligible	Number Eligible Weighted	Proportion Eligible (%)
Main Analysis	5	3	Whites	218	2,213,487	3.53
			Blacks	39	249,685	3.52
Sensitivity Analysis 1	5	2	Hispanics	29	133,588	3.42
			Whites	203	1,970,807	3.14
Sensitivity Analysis 2	5	5	Blacks	33	198,880	2.80
			Hispanics	26	122,380	3.14
Sensitivity Analysis 3	2	3	Whites	129	1,280,298	2.04
			Blacks	17	117,679	1.66
Sensitivity Analysis 4	2	2	Hispanics	18	95,640	2.45
			Whites	209	2,056,866	3.28
Sensitivity Analysis 5	2	5	Blacks	33	198,880	2.80
			Hispanics	26	122,380	3.14
Sensitivity Analysis 6	15	3	Whites	231	2,382,206	3.80
			Blacks	39	249,685	3.52
Sensitivity Analysis 7	15	2	Hispanics	29	133,588	3.42
			Whites	131	1,315,030	2.10
Sensitivity Analysis 8	15	5	Blacks	17	117,679	1.66
			Hispanics	18	95,640	2.45
Sensitivity Analysis 9	15	5	Whites	83	762,634	1.22
			Blacks	6	51,811	0.73
Sensitivity Analysis 10	15	5	Hispanics	11	42,941	1.10
			Whites	86	838,846	1.34
Sensitivity Analysis 11	15	5	Blacks	8	58,165	0.82
			Hispanics	13	50,250	1.29
Sensitivity Analysis 12	15	5	Whites	62	566,763	0.90
			Blacks	5	49,514	0.70
Sensitivity Analysis 13	15	5	Hispanics	9	34,934	0.90
			Whites	9	34,934	0.90

Note: Whites: non-Hispanic whites; Blacks: non-Hispanic blacks; total Part D drugs costs 4,000 in 2006 dollar for all analyses.

$P > 0.05$ when comparing Whites to Blacks and Whites to Hispanics based on all analyses.

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Table 3
Racial and ethnic disparities in meeting 2010–2011 Medicare MTM eligibility criteria in 1996–1997 according to main analysis.

	Estimate	Standard. Error	Wald Chi-Square	P	Odds Ratio (OR)	95% Confidence Interval for OR
Intercept	-4.24	0.62	47.13	<.0001	--	--
Non-Hispanic Whites	--	--	--	--	--	--
Non-Hispanic Blacks	-0.70	0.23	9.70	<0.01	0.50	0.32–.77
Hispanics	-0.14	0.23	0.38	0.54	0.87	0.56–1.36
Age	-0.01	0.01	4.18	0.04	0.99	0.98–1.00
Female	--	--	--	--	--	--
Male	-0.21	0.15	1.90	0.17	0.81	0.60–1.09
Not married	--	--	--	--	--	--
Married	-0.34	0.15	4.79	0.03	0.72	0.53–0.97
No private insurance	--	--	--	--	--	--
Any Private Insurance	0.52	0.17	8.93	<0.01	1.68	1.20–2.36
No Medicaid	--	--	--	--	--	--
Medicaid	0.50	0.21	5.81	0.02	1.66	1.10–2.50
Poor	--	--	--	--	--	--
Near poor	0.22	0.27	0.66	0.42	1.24	0.74–2.09
Low income	0.11	0.21	0.25	0.61	1.11	0.73–1.69
Middle income	0.23	0.20	1.26	0.26	1.25	0.85–1.86
High income	0.53	0.22	5.88	0.02	1.70	1.11–2.61
Lower than high school	--	--	--	--	--	--
GED or high school	-0.10	0.15	0.43	0.51	0.91	0.68–1.21
Bachelor	0.09	0.29	0.10	0.75	1.10	0.62–1.95
Master and higher	0.0003	0.32	0.00	1.00	1.00	0.53–1.87
Other	-0.24	0.41	0.35	0.56	0.78	0.35–1.76
Northeast	--	--	--	--	--	--
Midwest	0.27	0.22	1.57	0.21	1.32	0.86–2.02
South	0.09	0.20	0.21	0.65	1.09	0.74–1.61
West	0.06	0.21	0.09	0.77	1.06	0.71–1.60
Not MSA	--	--	--	--	--	--
Yes MSA	-0.06	0.16	0.13	0.72	0.95	0.69–1.29

	Estimate	Standard Error	Wald Chi-Square	P	Odds Ratio (OR)	95% Confidence Interval for OR
Excellent self-perceived health status	--	--	--	--	--	--
Very good self-perceived health status	0.76	0.38	3.93	0.05	2.14	1.01–4.53
Good self-perceived health status	1.69	0.35	23.13	<.0001	5.42	2.72–10.79
Fair self-perceived health status	2.44	0.35	49.17	<.0001	11.52	5.82–22.82
Poor self-perceived health status	2.99	0.35	70.89	<.0001	19.83	9.89–39.74

Note: Covariates based on the Andersen's model are predisposing factors (age, gender, and marital status), enabling factors (highest degree received, income, insurance status, metropolitan statistical area, and geographic regions), and need factors (self-perceived health status).

Table 4

Proportions of meeting each MTM eligibility criterion among the Medicare population in 1996–1997.

Criterion	Groups	Non-Hispanic Whites		Non-Hispanic Blacks		Hispanics	
		No.	%	No.	%	No.	%
No. of conditions 2	No	1,872	36.99	344	35.81	298	38.03
	Yes	3,597	63.01	639	64.19	504	61.97
No. of conditions 3	No	2,904	55.93	540	55.42	432	53.03
	Yes	2,565	44.07	443	44.58	370	46.97
No. of conditions 5	No	4,436	81.94	824	83.46	659	80.37
	Yes	1,033	18.06	159	16.54	143	19.63
No. of drugs 2 ^a	No	1,177	22.56	270	28.33	201	25.52
	Yes	4,292	77.44	713	71.67	601	74.48
No. of drugs 5	No	2,890	54.20	553	58.23	432	53.90
	Yes	2,579	45.80	430	41.77	370	46.10
No. of drugs 15	No	4,110	76.24	762	79.77	610	75.05
	Yes	1,359	23.76	221	20.23	192	24.95
No. of drugs 25	No	5,205	95.58	945	96.48	758	94.34
	Yes	264	4.42	38	3.52	44	5.66
Drug costs > \$4,000	No	5,219	95.81	944	96.48	771	96.19
	Yes	250	4.19	39	3.52	31	3.81
Drug costs > \$3,000	No	4,980	91.80	907	93.53	748	92.61
	Yes	489	8.20	76	6.47	54	7.39

Differences between non-Hispanic Whites and Hispanics were not significant for any criteria.

^a $P < 0.05$ for the differences between non-Hispanic Whites and non-Hispanic Blacks.

Table 5

Trend of MTM disparities among Medicare population based on 2008 eligibility criteria.

	Estimate	Standard. Error	Wald Chi-Square	P	Odds Ratio (OR)	95% Confidence Interval for OR
Intercept	-4.47	0.32	192.29	<.0001	--	--
Non-Hispanic Whites	--	--	--	--	--	--
Non-Hispanic Blacks	-0.33	0.26	1.65	0.20	0.72	0.43-1.19
Hispanics	-0.24	0.26	0.87	0.35	0.79	0.48-1.30
Blacks*(2007-2008)	0.04	0.28	0.02	0.89	1.04	0.60-1.80
Hispanics*(2007-2008)	-0.10	0.29	0.12	0.73	0.91	0.51-1.60
1996-1997	--	--	--	--	--	--
2007-2008	1.81	0.10	303.11	<.0001	6.09	4.97-7.46
Age	-0.01	0.003	8.23	<0.01	0.99	0.99-1.00
Female	--	--	--	--	--	--
Male	-0.12	0.07	2.90	0.09	0.89	0.77-1.02
Not married	--	--	--	--	--	--
Married	-0.02	0.09	0.07	0.79	0.98	0.82-1.17
No private insurance	--	--	--	--	--	--
Any Private Insurance	0.26	0.07	12.57	<0.01	1.30	1.13-1.51
No Medicaid	--	--	--	--	--	--
Medicaid	0.57	0.12	24.06	<.0001	1.77	1.41-2.22
Poor	--	--	--	--	--	--
Near poor	-0.13	0.14	0.82	0.37	0.88	0.66-1.16
Low income	-0.01	0.12	0.002	0.96	0.99	0.79-1.25
Middle income	-0.07	0.11	0.39	0.53	0.94	0.76-1.16
High income	0.04	0.12	0.12	0.73	1.04	0.82-1.32
Lower than high school	--	--	--	--	--	--
GED or high school	0.02	0.09	0.04	0.85	1.02	0.85-1.21
Bachelor	0.31	0.15	4.39	0.04	1.37	1.02-1.84
Master and higher	0.18	0.17	1.02	0.31	1.19	0.85-1.68
Other	0.36	0.18	4.17	0.04	1.44	1.02-2.04
Northeast	--	--	--	--	--	--
Midwest	-0.05	0.12	0.15	0.70	0.96	0.75-1.21

	Estimate	Standard Error	Wald Chi-Square	P	Odds Ratio (OR)	95% Confidence Interval for OR
South	-0.04	0.11	0.12	0.73	0.96	0.77-1.20
West	-0.24	0.13	3.62	0.06	0.78	0.61-1.01
Not MSA	--	--	--	--	--	--
Yes MSA	0.01	0.10	0.02	0.89	1.01	0.84-1.23
Excellent self-perceived health status	--	--	--	--	--	--
Very good self-perceived health status	1.02	0.20	25.17	<.0001	2.76	1.86-4.11
Good self-perceived health status	1.65	0.19	73.09	<.0001	5.18	3.55-7.56
Fair self-perceived health status	2.19	0.19	126.41	<.0001	8.92	6.09-13.07
Poor self-perceived health status	2.68	0.20	179.91	<.0001	14.52	9.82-21.46

MTM: Medication therapy management; Blacks: non-Hispanic Blacks; CI: confidence interval. Covariates based on the Andersen's model are predisposing factors (age, gender, and marital status), enabling factors (highest degree received, income, insurance status, metropolitan statistical area, and geographic regions), and need factors (self-perceived health status).