



# Racial and Ethnic Disparities in Diabetes Care and Impact of Vendor-Based Disease Management Programs

*Diabetes Care* 2016;39:743–749 | DOI: 10.2337/dc15-1323

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## OBJECTIVE

We examined the existence of disparities in receipt of appropriate diabetes care among California's fee-for-service Medicaid beneficiaries and the effectiveness of a telephonic-based disease management program delivered by a disease management vendor on the reduction of racial/ethnic disparities in diabetes care.

## RESEARCH DESIGN AND METHODS

We conducted an intervention-control cohort study to test the effectiveness of a 3-year-long disease management program delivered to Medicaid fee-for-service beneficiaries aged 22 to 75 with a diagnosis of diabetes in Los Angeles and Alameda counties. The outcome measures were the receipt of at least one hemoglobin A<sub>1c</sub> (HbA<sub>1c</sub>) test, LDL cholesterol test, and retinal examination each year. We used generalized estimating equations models with logit link to analyze the claims data for a cohort of beneficiaries in two intervention counties ( $n = 2,933$ ) and eight control counties ( $n = 2,988$ ) from September 2005 through August 2010.

## RESULTS

Racial/ethnic disparities existed in the receipt of all three types of testing in the intervention counties before the program. African Americans (0.66; 95% CI 0.62–0.70) and Latinos (0.77; 95% CI 0.74–0.80) had lower rates of receipt for HbA<sub>1c</sub> testing than whites (0.83; 95% CI 0.81–0.85) in the intervention counties. After the intervention, the disparity among African Americans and Latinos compared with whites persisted in the intervention counties. For Asian Americans and Pacific Islanders, the disparity in testing rates decreased. We did not find similar disparities in the control counties.

## CONCLUSIONS

This disease management program was not effective in reducing racial/ethnic disparities in diabetes care in the most racially/ethnically diverse counties in California.

Diabetes disproportionately affects racial/ethnic minority populations. Compared with white adults, the risk of having a diabetes diagnosis is 77% higher among African Americans, 66% higher among Latinos/Hispanics, and 18% higher among Asian Americans (1). Despite the high prevalence of the condition, minorities experience lower quality of care and greater barriers to self-management compared with white patients (2,3). Racial/ethnic minorities are less likely to receive recommended services for diabetes, such as annual hemoglobin A<sub>1c</sub> (HbA<sub>1c</sub>) testing,

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Received 18 June 2015 and accepted 18 February 2016.

This article contains Supplementary Data online at <http://care.diabetesjournals.org/lookup/suppl/doi:10.2337/dc15-1323/-/DC1>.

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annual LDL cholesterol (LDL-C) testing, and an annual retinal examination (4). Racial/ethnic disparities in health care can be found everywhere in the U.S. health care delivery system, even in public insurance programs, including Medicaid (5). Medicaid is the largest provider of health insurance for low-income and minority populations, with ~60% of beneficiaries being racial/ethnic minorities (6). With the implementation of the Patient Protection and Affordable Care Act (ACA), states were allowed to expand Medicaid to previously uninsured individuals. After full implementation of the ACA, Medicaid now covers more than 18% of all American adults (7). Federal and state government agencies have developed and implemented disease management programs (8) for Medicare and Medicaid beneficiaries to reduce the double-digit increases in health care costs and to address system-wide health care quality issues (9).

Two main types of disease management programs, provider-based and third party (vendor)-based, have been adopted by private and public insurers (10). Almost all third party-based disease management programs rely on a patient-focused telephonic intervention as a strategy for reaching large populations with one or more chronic illnesses that may be at risk for exacerbation (11,12). The Centers for Medicare & Medicaid Services (CMS) have tested a variety of disease management programs, including provider-based, third-party-based, and hybrid models, for Medicare populations with chronic conditions, dating back to 1999 (10). However, there is little evidence to conclusively state that disease management programs have decreased hospitalizations and emergency department visits, improved prescription drug adherence, lowered costs (13), or alleviated racial and ethnic disparities among the participants (14). Also, telephonic disease management programs have been criticized recently for their inability to produce sufficient savings and improvement in health outcomes (15,16).

The California Department of Health Care Services (CDHCS) conducted a CMS-approved pilot disease management program for Medi-Cal (California Medicaid program) fee-for-service adult beneficiaries with a diagnosis of diabetes and other selected chronic conditions from 1

September 2007 to 31 August 2010 (17). A vendor (McKesson Health Solutions) was selected through a competitive procurement process to provide telephonic disease management services to the targeted populations in Alameda and Los Angeles Counties (17). The disease management program was designed to regularly contact high-risk, actively engaged beneficiaries to assess their health status, encourage receipt of appropriate screenings and care from their providers, and provide coaching or follow-up to encourage adherence to their personalized disease management plans (please see details of the disease management program in the Supplementary Data). However, the overall rate of active engagement was ~10% per program year. Most of those who were ever contacted received only one call, with a median of three calls per person over their full duration of eligibility.

Our recent literature search suggests limited information is available regarding disparities in diabetes care within the Medicaid fee-for-service population and whether disease management programs are effective in reducing or eliminating such differences among this population. This information is extremely important because the chronically ill Medicaid population comprises one-third of the nation's Medicaid population and accounts for an estimated 80% of total Medicaid expenditures (18). To address the current gaps in the literature, this study examined two important questions on the quality of diabetes care among Medi-Cal fee-for-service populations in the intervention counties:

1. Were there any racial/ethnic differences in diabetes care among these beneficiaries?
2. Did a telephonic-based and patient-focused disease management program, delivered by a private vendor, improve diabetes care and decrease racial/ethnic disparities in the receipt of comprehensive diabetes care?

## RESEARCH DESIGN AND METHODS

### Study Population and Data Source

Medi-Cal claims data from the CDHCS between 1 September 2005 and 31 August 2010 were used. The study population includes fee-for-service Medi-Cal beneficiaries, ages 22–75, diagnosed with diabetes residing in two intervention

counties (Alameda and Los Angeles) and eight control counties (Fresno, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, San Joaquin, and Santa Clara). The two intervention counties comprise 30% of Californians and have more racially/ethnically diverse populations (71%) than the overall Californian population (60%). The selection of the control counties was based on a reasonable match of intervention counties using cluster analysis on paid claims (costs), disease rates, demographic characteristics (age, sex, ethnicity, and language), and service use (number of hospitalizations, emergency department visits, and doctor visits) at the county level for the purpose of expenditure comparison. For this study, we used the Healthcare Effectiveness Data and Information Set (HEDIS) definition to define the beneficiaries with diabetes (type 1 and type 2), which requires that they have had at least two or more outpatient visits with a documented diabetes diagnosis, one or more acute inpatient or emergency department visits with a documented diabetes diagnosis, or medication dispensed with a documented diabetes diagnosis during the measurement year and the prior year. The beneficiaries were also required to be continuously enrolled, defined as having no more than a 1-month gap in Medicaid coverage, in the years before measurement and in the measurement years.

The disease management program ran for 3 years, from 1 September 2007 to 31 August 2010. Among beneficiaries with diabetes, those who were aged 45–65, female, and white were more likely to be actively engaged in the program (19). The sample included a cohort of 5,921 beneficiaries with diabetes (2,933 in two intervention counties and 2,988 from eight control counties) who were continuously enrolled from September 2005 to August 2010.

### Outcome Measures

This analysis focused on three outcomes defined by HEDIS regarding receipt of 1) at least one HbA<sub>1c</sub> blood test within the past year, 2) at least one LDL-C screening during the past year, and 3) one or more retinal examinations during the measurement year or prior year. HEDIS measurement specifications change slightly over time; thus, the testing rates were adjusted to reflect HEDIS specifications

relevant to each measurement year of the study (20).

### Other Variables

The main independent variable of interest was race/ethnicity, including whites (reference), Latinos, African Americans, Asian Americans and Pacific Islanders (AAPIs), and others. We also included the grouping of intervention counties and control counties. This analysis used 1 September 2005 through 31 August 2007 as preintervention years and September 2007 to August 2010 as postintervention years. We also included three-way interaction (intervention vs. race/ethnicity vs. program years) and two-way interactions in the models.

The presence of a comorbidity was determined by whether the individual had a diagnosis of one or more of the following conditions: chronic obstructive pulmonary disease, asthma, congestive heart failure, or coronary artery disease. A log-transformed disease severity score was defined by the Chronic Illness and Disability Payment System (21), using the ICD-9-CM codes and National Drug Codes from the claim data. Each individual in our study population was assigned a disease severity score at baseline and each intervention year to reflect any changes in his or her disease severity.

### Statistical Analyses

Unadjusted rates of the outcome measures (receipt of annual HbA<sub>1c</sub> testing, annual LDL-C testing, and an annual retinal examination according to HEDIS measures) and distributions of population by characteristics (race/ethnicity, sex, English-speaking capacity, comorbidity rates) in the intervention and control counties were tested using  $\chi^2$  tests. Generalized estimating equations were used to examine the trends of receipts of the examinations over time by intervention and control counties and by racial/ethnic groups controlling for age, sex, language, comorbidity, and disease severity score with logit links to model the binary outcomes adjusting for the nature of panel data. Specifically, we tested the significance of three-way interaction and two-way interactions. Post hoc tests were conducted to investigate the disparity in receipt of annual HbA<sub>1c</sub> testing, annual LDL-C testing, and an annual retinal examination for pre- and postintervention years. Difference-in-difference analysis on probability scale was conducted separately for

intervention counties and control counties to explore whether the variations in diabetes care between whites and other races/ethnicities were significant in the preintervention (2005–2006) and postintervention (2009–2010) periods. The analyses were conducted using Stata 13 software.

## RESULTS

Descriptive characteristics for the total sample population in the baseline year, by intervention and control groups, are provided in Table 1. During the baseline year, the unadjusted testing rates varied between the intervention and control counties. HbA<sub>1c</sub> testing rates during the baseline year were 79% in the intervention counties and 71% in the control counties. Almost 80% of beneficiaries in the intervention counties had received LDL-C testing during the baseline year compared with only 72% of individuals in the control counties ( $P < 0.001$ ). Annual retinal screening rates were 92% vs. 89% in the intervention and control counties, respectively ( $P < 0.001$ ).

We found that the three-way interaction was not significant, indicating there was no intervention effect on racial/ethnic disparity by program years. The two-way interaction of race/ethnicity versus program years was also not significant, indicating the disparity persisted after the intervention. However, the

two-way interaction between intervention and race/ethnicity was significant, indicating that the existence of disparity differed between the intervention and control groups. The results for receipt of annual HbA<sub>1c</sub> testing, annual LDL-C testing, and annual retinal examination for pre- and postintervention periods by intervention and control counties and by racial/ethnic groups, controlling for age, sex, language, comorbidity, and disease severity score, are presented in Figs. 1–3.

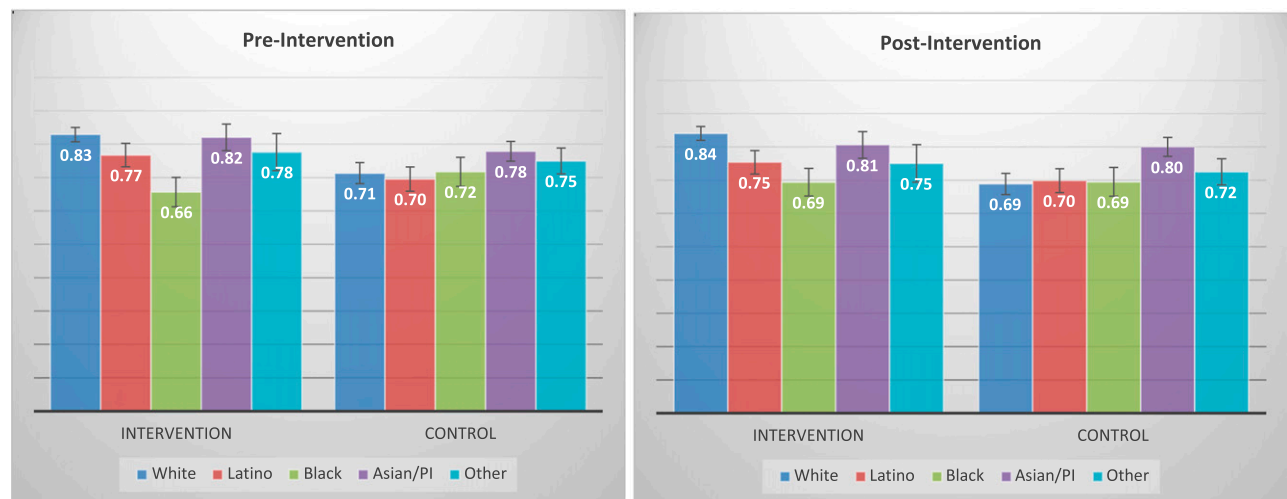
### Receipt of HbA<sub>1c</sub> Testing

The adjusted rate of receipt for HbA<sub>1c</sub> testing in the intervention and control counties before and after the intervention by race/ethnicity is shown in Fig. 1. The results indicate that before the intervention, racial/ethnic minorities, such as African Americans (0.66; 95% CI 0.62–0.70) and Latinos (0.77; 95% CI 0.74–0.80), had lower rates for HbA<sub>1c</sub> testing than whites (0.83; 95% CI 0.81–0.85) in the intervention counties, whereas AAPIs and other racial/ethnic groups in the intervention counties had comparable rates of HbA<sub>1c</sub> testing with whites. Persons in the control counties did not have different rates of annual HbA<sub>1c</sub> testing among racial/ethnic groups, except that AAPIs (0.78; 95% CI 0.75–0.81) had higher rates than whites (0.71; 95% CI 0.68–0.74).

Overall, there were no changes in the receipt of HbA<sub>1c</sub> testing from pre- to

**Table 1—Descriptive summary of sample population by intervention and control group at baseline (2005–2006)**

	Total (N = 5,912)		P value
	Intervention (%) n = 2,933	Control (%) n = 2,988	
Testing rates			
HbA <sub>1c</sub>	78.66	70.78	0.00
LDL-C testing	80.33	71.92	0.00
Retinal examinations	92.36	89.02	0.00
Race			0.00
White	45.38	26.44	
Latino	18.99	20.25	
African American	15.85	13.89	
AAPI	12.41	23.93	
Others	7.36	15.5	
Female sex (vs. male)	64.13	65.16	0.40
English, yes (vs. no)	25.3	37.62	0.00
Age-group (years)	19.33	29.52	0.00
≤50	43.03	42.6	
51–59	37.64	27.88	
≥60			
Comorbidity, yes (vs. no)	57.82	48.39	0.00



**Figure 1**—Predicted HbA<sub>1c</sub> testing rates by race/ethnicity, intervention, and preintervention and postintervention. Error bars represent the 95% CI.

postprogram periods in the intervention counties after adjusting for the baseline differences between control and intervention counties. The difference-in-difference results from the two-way interaction indicate that after the intervention, the probability of undergoing at least an annual HbA<sub>1c</sub> test in the intervention counties was still different for African Americans (0.69; 95% CI 0.65–0.73) and Latinos (0.75; 95% CI 0.71–0.79) than for whites (0.84; 95% CI 0.82–0.86), whereas the differences in testing rates between AAPIs and others versus whites also remained nonsignificant through the end of the program year (Fig. 1). Furthermore, differences in testing rates in the control counties were not observed between whites, African Americans, Latinos, and others, but higher rates were persistent among AAPIs.

#### Receipt of LDL-C Testing

The adjusted rate of annual LDL-C testing for the pre- and postintervention years is shown in Fig. 2. Before the intervention, results of the regression model indicated that compared with whites (0.87; 95% CI 0.85–0.89), Latinos (0.75; 95% CI 0.71–0.78), African Americans (0.65; 95% CI 0.61–0.69), AAPIs (0.79; 95% CI 0.76–0.83), and others (0.78; 95% CI 0.72–0.84) had lower rates of having had LDL-C testing in the intervention counties. However, in the control counties, there were no differences in rates of LDL-C testing among racial/ethnic groups in the prior intervention years.

After the intervention, the difference-in-difference results indicate the disparities

in LDL-C testing rates remained between whites, Latinos, African Americans, and others in the intervention counties. However, the differences in LDL-C testing rates between whites and AAPIs were eliminated in the intervention counties. In addition, we saw a similar pattern in the control counties after the intervention years, with no changes in LDL-C testing rates between Latinos, African Americans, and other versus whites (Fig. 2), but the testing rates among AAPIs were higher than for whites.

#### Receipt of Annual Retinal Examination

Results of the regression model (Fig. 3), adjusting for covariates of interest, demonstrated that African Americans had lower rates (0.84; 95% CI 0.81–0.87) than whites (0.94; 95% CI 0.93–0.95) of annual retinal examinations in the baseline year; however, all of the other racial/ethnic groups had comparable rates with whites in the intervention counties. The beneficiaries in the control counties had comparable rates of receiving an annual retinal examination among racial/ethnic groups, except for AAPIs, who had higher rates of testing (0.95; 95% CI 0.94–0.96).

After the intervention, the difference-in-difference estimate reflects a decrease in retinal examination rates, especially among African Americans (0.78; 95% CI 0.74–0.82), from pre- to postprogram years in the intervention counties (Fig. 3). As a result, the disparity in retinal examinations remained between whites (0.90; 95% CI 0.88–0.92) and African Americans. Again, the beneficiaries in

the control counties had lower rates of receiving an annual retinal examination than the preintervention years, but comparable patterns among racial/ethnic groups remained.

#### CONCLUSIONS

Our findings indicate that racial/ethnic disparities existed in the receipt of appropriate diabetes care in the intervention counties, most pronounced for African Americans, but also for Latinos and other racial/ethnic groups, before the implementation of a disease management pilot program among California's fee-for-service Medicaid beneficiaries. Additionally, we found that the vendor-based disease management program in California did not improve diabetes care or reduce racial/ethnic disparities in care among these beneficiaries. The results show that the disparities in all three diabetes care indicators remained at the end of the intervention period for African Americans and Latinos in the intervention counties compared with whites. However, the testing rates for AAPIs were higher or the same in comparison with whites in both intervention and control counties.

Our study is one of a very limited number of studies that shows racial/ethnic differences regarding receipt of appropriate care for Medicaid beneficiaries (22). The observed disparities in diabetes care among Medicaid fee-for-service populations are consistent with the findings in the overall population (23,24) and in the Medicare population (25–27).



**Figure 2**—Predicted LDL-C testing rates by race/ethnicity, intervention, and preintervention and postintervention. Error bars represent the 95% CI.

These findings are important because racial/ethnic minorities, specifically Latinos and African Americans, are disproportionately more likely than whites to be enrolled in Medicaid. These findings also have important clinical implications because racial/ethnic disparity in receiving these critical clinical services could be associated with minorities having much higher rates of diabetes-related complications and death, including heart disease, blindness, end-stage kidney disease, peripheral neuropathy, and nontraumatic amputation (28,29).

Our findings suggest that the vendor-based disease management program was not effective in reducing racial/ethnic

disparities in diabetes care for the Medicaid fee-for-service population. Disease management programs exist in a variety of settings, with a focus on both chronic disease management and preventive care (13). The perceived benefits of disease management programs are their emphases on patient involvement through education and self-activation with the goal of improving receipt of necessary and appropriate care, which should result in improved health outcomes and cost savings (12). Although some disease management programs that include counseling, information feedback, education, and other patient support mechanisms are found to be

positively correlated with improved health outcomes (9), most of the programs have mixed findings with respect to improving quality of care, reducing disparities in care, and controlling costs (14, 30, 31). The frequency of contacts of disease management programs may be an important factor. One study suggested that moderate or high frequency of contact led to an improvement compared with low frequency of contact (32). Low frequency of contact by the disease management vendor in this study may explain why this particular pilot program was not effective in improving the appropriate care and reducing disparities in care. Although the disease



**Figure 3**—Predicted retinal examination rates by race/ethnicity, intervention, and preintervention and postintervention. Error bars represent the 95% CI.



management vendor attempted to deliver proactive telephonic interventions to all of the actively engaged members, a significant proportion of the “engaged” members received little or no intervention. Furthermore, the intensity of the intervention among the actively enrolled population was low, with ~2.7 to 3.4 monitoring calls per person during the 3-year intervention.

One of the issues that affected this program implementation was missing or incorrect contact information for eligible beneficiaries because the vendor delivered the intervention almost exclusively through mailings and telephone calls. Of the 54,051 individuals who were ever eligible for the disease management program during the 3-year program period, the vendor reported that ~25% had incorrect or missing contact information for some periods of their eligibility, although correct contact information was eventually found for many of these individuals.

Another possible explanation is language barriers. For instance, no information is available documenting whether the interventions were conducted in languages other than English, given that 75% of the participants in this study population reported not speaking English. Although telephonic translation was available between English-speaking nurses and beneficiaries with limited English proficiency, such as those speaking Spanish and Armenian, this option may not have fully resolved language barriers to participation.

Our findings highlight the complex nature of disparities in health care, especially for Medicaid populations (12). Medicaid beneficiaries could face significant barriers due to their language, literacy, culture, disability, mental illness, poverty, and abilities to find a primary care doctor (12,33). Disease management programs that involve providers, are incorporated at all levels of care, and are tailored to the cultural needs of various racial/ethnic groups might be more effective (14,34). For instance, disease management programs that include health literacy and education outreach are associated with enhanced self-efficacy and self-care behaviors (12,35).

Several limitations related to the data may prevent us from fully explaining the effectiveness of the disease management program. First, limited information is

available about the content and intensity of the disease management intervention, especially specific efforts made to reduce racial/ethnic disparities in care. Though the intervention information was available at the individual level, only 10% of the eligible population was actively engaged, and most of them received only one call. It is difficult to determine whether there was a possible “dose response” of the intervention as well as using a categorical method to determine the effect of receiving any calls versus no call. Second, no information is available on the clinical status of participants with respect to HbA<sub>1c</sub> and LDL-C levels because no laboratory values are available from the claims data. Third, information describing the study population was limited to claims data only. We lacked information on physician practices for these patients and the vendor’s effect on the providers’ practices, although the vendor was supposed to contact the providers of the eligible population to coordinate care delivery. Fourth, the observed disparities in the intervention counties do not seem to be generalizable to the control counties. Because no information was available regarding the availability of other disease management programs and the adequacy of providers accepting Medicaid patients in the intervention or control counties, it would be difficult to fully explain the differences between intervention and control counties. So, the control counties mainly serve as a comparison group for contextual information, which allows us to ascertain whether any changes in diabetes care are attributable to disease management program interventions and not to other secular trends.

Although this and other studies have demonstrated a range of efficacy for disease management programs, the effectiveness of vendor-based disease management programs in reducing racial/ethnic disparities in diabetes care for Medicaid fee-for-service population remains questionable. Public and private efforts to improve self-management skills and care-seeking behaviors of patients with diabetes should carefully examine whether vendor-based and patient-focused disease management programs can improve quality of care. As a result, the implementation of disease management programs should include a prospective evaluation such

as this one, which can provide ongoing feedback to the program designers about the success or failure of the key components of the program during the implementation period. Because California, especially the two intervention counties, has one of the most diverse Medicaid populations in the country, we believe our results are applicable to Medicaid populations in other parts of the country with diverse populations.

**Funding.** This evaluation was funded by the CDHCS (contract number 06-55552).

**Quality of Interest.** No potential conflicts of interest relevant to this article were reported.

**Author Contributions.** Y.-Y.M. and J.J. conceptualized the research question and study design and wrote the manuscript. A.D. contributed to writing the manuscript and reviewed and edited the manuscript. J.J., W.L., and S.-H.W. conducted data analyses under the directions of Y.-Y.M. and X.C. N.P., D.R., and G.F.K. reviewed and edited the manuscript. X.C. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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