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Race/Ethnicity and economic differences in cost-related medication underuse among insured adults with diabetes. The TRIAD study.

Chien-Wen Tseng, MD, MPH[1,2], Ed Tierney, MPH[3], Robert B Gerzoff, MS[3], R Adams Dudley, MD, MBA[4], Beth Waitzfelder, PhD[1], Ronald T Ackermann, MD, MPH[5], Andrew J Karter, PhD[6], John Piette, PhD[7], Jesse Crosson, PhD[8], Quyen Ngo-Metzger, MD, MPH[9], Richard Chung, MD[10], Carol M Mangione, MD, MSPH[11]

[1] Pacific Health Research Institute, Honolulu, HI.
[2] Department of Family Medicine and Community Health, John A. Burns School of Medicine, University of Hawaii, Honolulu, HI.
[3]Division of Diabetes Translation, Centers for Disease Control and Prevention, Atlanta, GA
[4]Department of Medicine and Institute for Health Policy Studies, University of California, San Francisco, San Francisco, CA
[5]Department of Medicine, Indiana University School of Medicine, Indianapolis, IN
[6]Division of Research, Kaiser Permanente Medical Care Program, N. California, Oakland, CA.
[7]Department of Veterans Affairs Center for Practice Management and Outcomes Research and Department of Internal Medicine, University of Michigan, Ann Arbor, MI.
[8]Department of Family Medicine, University of Medicine and Dentistry, New Jersey , New Jersey Medical School, Newark, NJ
[9]Division of General Medicine and Primary Care and the Center for Health Policy Research, University of California Irvine College of Medicine, Irvine, CA
[10]Hawaii Medical Services Association, Honolulu HI
[11]David Geffen School of Medicine and School of Public Health, University of California, Los Angeles, Los Angeles, CA

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Corresponding author:
Chien-Wen Tseng
c/o Pacific Health Research Institute
846 S. Hotel St. #303
Honolulu, HI 96813
cwtseng@hawaii.edu

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ABSTRACT

Objective: To examine racial/ethnic and economic variation in cost-related medication underuse among insured adults with diabetes.

Research Design and Methods: We surveyed 5086 participants from the multi-center Translating Research Into Action for Diabetes (TRIAD) study. Respondents reported whether they used less medication because of cost in the past 12 months. We examined unadjusted and adjusted rates of cost-related medication underuse, using hierarchical regression, to determine if race/ethnicity differences still existed after accounting for economic, health, and other demographic variables.

Results: Participants were 48% white, 14% African-American, 14% Latino, 15% Asian/Pacific Islander, and 8% other. Overall, 14% reported cost-related medication underuse. Unadjusted rates were highest for Latinos (23%) and African Americans (17%), compared to whites (13%), Asian/Pacific Islanders (11%), and others (15%). In multivariate analyses, race/ethnicity significantly predicted cost-related medication underuse (p=0.048). However adjusted rates were only slightly higher for Latinos (14%) than whites (10%) (p=0.026), and were not significantly different for African Americans (11%), Asian/Pacific Islanders (7%), and others (11%). Income and out-of-pocket drug costs showed the greatest differences in adjusted rates of cost-related medication underuse: 15% vs. 5% for participants with income <= $25K vs. >$50K, and 24% vs. 7% for participants with out-of-pocket costs > $150/month vs. <=$50/month.

Conclusions: One in seven participants reported cost-related medication underuse. Rates were highest among African Americans and Latinos, but were related to lower incomes and higher out-of-pocket drug costs in these groups. Interventions to decrease racial/ethnic disparities in cost-related medication underuse should focus on decreasing financial barriers to medications.

Diabetes affects approximately 21 million U.S. adults and is most prevalent among African Americans, Latinos, American Indians, and Asian/Pacific Islanders (1). Many racial/ethnic minorities also demonstrate worse control of their diabetes than whites, and poorer control of other cardiovascular risk factors such as hypertension and hyperlipidemia that are often present in persons with diabetes (2-6). Compared to whites, non-whites often have poorer glycemic control (African Americans, Latinos, Asian/Pacific Islanders) (2,3), poorer blood pressure control (African Americans, Latinos) (2,4), poorer low-density liproprotein (LDL) control (African Americans) (2,4), and higher rates of end-stage renal disease (African Americans, Latinos, Asian/Pacific Islanders) (5).

One potential explanation for these racial disparities in health is that medication adherence differs across racial and ethnic groups (6-8). This is especially important to examine for medication nonadherence due to cost, since high rates of cost-related underuse have been reported among persons with diabetes - ranging from 18% to 31% for any medication (including non-diabetes medications) among those patients with drug insurance, to as high as 49% in older persons with diabetes who lack drug insurance (9-14). Regarding the impact of cost-sharing specifically on diabetes medications, between 9% to 11% of adults with diabetes report using less diabetes medications than prescribed because of cost (9,11). This leads to potentially negative impacts on health, since nonadherence to diabetes medications is associated with poorer glycemic control (9,15,16) acute care use (15,17,18), and higher mortality rates (15). Since socioeconomic factors (e.g. income) are known to affect medication use (10,19-24) and can also vary among racial/ethnic groups, it is important to know whether any cost-related medication underuse differences by race/ethnicity remain after adjusting for economic and other demographic factors.

Prior studies on cost-related medication underuse have been mainly of older persons with chronic illnesses (10,11,19-25), and the effect of race/ethnicity on cost-related medication underuse has been mixed. Some studies have found race/ethnicity to be a significant predictor and other studies have found it to be non-significant (24). However, few studies have focused specifically on persons with diabetes (11,12,14) included adults of all ages, and many studies have compared white vs. non-white (11,19,20,25) or analyzed only one or two, but not three primary race/ethnicities including African Americans, Latinos, and Asian/Pacific Islanders. In this study, we examined racial/ethnic differences in cost-related medication underuse in a large cohort of racially diverse, relatively well-insured adults with diabetes, and determine to what extent economic variables (e.g. income, lack of drug coverage) mitigate any differences.

RESEARCH DESIGN AND METHODS

We used data from a nationwide sample of insured adults with diabetes from the ongoing Translating Research Into Action for Diabetes (TRIAD) study of patients in managed care. TRIAD is a longitudinal study of persons with diabetes in managed care plans. Details of the study design have previously been published (26). Briefly, 11,927 patients were recruited in 2000-2001 from 10 health plans serving some 180,000 individuals with diabetes in California, Hawaii, Indiana, Michigan, New Jersey, Pennsylvania, and Texas. Participants were eligible if they had diabetes; were age 18 years or older; enrolled in a TRIAD health plan for 18 months or longer; had at least one health care claim during that time; received most of their care from the plan; and could

complete a written or telephone survey in English or Spanish. The study excluded nursing home residents, pregnant women, and persons unable to provide informed consent.

TRIAD participants were surveyed again in 2002-2003 (Wave 2) and 2004-2005 (Wave 3) (Figure 1). Data for the current study come from the 2004-2005 Wave 3 survey, where questions were included about cost-related medication underuse. A total of 8,157 participants were potentially eligible for the Wave 3 survey, representing those participants who completed the Wave 2 survey and were still eligible (i.e., had not died or been admitted to nursing homes).

Variables. We examined five categories for self-reported race/ethnicity: non-Latino white (white), non-Latino African American (African American), Latino, Asians/Pacific Islanders, and "other". To measure cost-related medication underuse, participants were asked, "In the past 12 months, did you use less medication than you wanted to or than was prescribed because of the cost (e.g., skip doses, not fill prescriptions, or not start medications)?"; responses were dichotomous, yes/no. Participants also reported their annual household income, if they had prescription drug benefits, their average monthly out-of-pocket prescription drug costs over the last three months, number of prescription medications, demographic characteristics (e.g., age, gender, education), duration of diabetes, and health status.

Statistical methods. Cost-related medication underuse in the prior twelve months (any vs. none) was our dependent variable. We fit a hierarchical logistic regression model using a penalized quasi-likelihood estimation method. We used random intercepts for health plans to account for the clustered study design and correlation among participant characteristics within the ten health plans represented among the participants (PROC GLIMMIX, SAS version 9.1.) The intra-class correlation among health plans was 0.0119. Race/ethnicity, income, prescription drug coverage, and out-of-pocket drug costs were the main independent variables of interests (predictors). We used multivariate analyses models to control for potential confounding by age, gender, education, general health status (poor to excellent), and number of medications (1-5 medications vs. 6 or more medications). Monthly out-of-pocket drug costs were represented by 5 categories: $0-$50, $51-$100, $101-$150, and >$150/month based distribution across population and previous literature showing that out-of-pocket drug costs of >$50/month and > $100/month were risk factors for cost-related medication underuse (22). Medication categories were divided into 1-5 vs. 6 or more medications since participants reported their number of prescription medications with the highest category represented by "6 or more medications". This dichotomous group also represented the median cut-off for the number of medications reported by participants(1-5 medications [51%] vs. 6 or more medications [49%]).

Duration of diabetes and four two-way interaction terms (race/ethnicity by age, gender, income, and out-of-pocket drug costs) were assessed, but were not significant and were dropped for reasons of parsimony. Missing covariate values were multiply-imputed using IVEware 2.0 version. On average, approximately 6% of responses across all variables in the models were missing. Excluding income, which had the most missing data (18%), the rate of missing responses averaged 5% for all other variables. To increase interpretability of the results, we present both unadjusted and adjusted conditional predicted percents of cost-related medication underuse calculated from the multivariate models.

RESULTS

Demographics by race/ethnicity. Of the 8,157 potentially eligible participants, a total of

5,753 completed interviews, 464 refused, and the remainder were ineligible or lost to follow-up (Figure 1). Assuming that persons unable to be contacted had the same rate of eligibility as those contacted, the CASRO (Council of American Survey Research Organizations) response rate would have been 75%. The final sample size for the analysis was 5,086 after excluding those participants who either completed a short version of the survey that omitted questions on cost-related underuse (n=650), reported no medication use (n=16), or for whom we could not establish membership in a participating health plan (n=1). Two percent of all participants (n=105) completed the survey in Spanish, and these participants represented 15% of the Latino respondents. Persons who participated in the baseline survey but not the wave 3 survey, compared to persons who participated in both surveys, were more likely to be non-white (64% vs. 52%), slightly younger (average age 63.5 years vs. 64.4 years), less educated (59% vs. 47% high school education or less), and lower income (40% with income < $20,000 vs. 40% with income < $25,000). Both groups had similar percentages of female participants (53% vs. 54%).

The study population self-reported as 48% white, 14% African American, 14% Latino, 15% Asian/Pacific Islander, and 8% other (Table 1). Whites and Asian/Pacific Islanders typically reported the highest income and educational levels. Latinos and African Americans were the least likely to have prescription drug coverage (67%) and Latinos were the most likely to have out-of-pocket drug costs of greater than $100/month (32%). Asian/Pacific Islanders were younger and African Americans had higher percentages of women respondents than other race/ethnicities. Whites were also more likely than any of the other racial/ethnic groups to report "excellent" or "good" health (22%), while African Americans and Latinos were the most likely to report "fair" or "poor" health (50% and 43% respectively).

Cost-related Medication Underuse. Overall, cost-related medication underuse was reported by 14% (n=704) of the participants (Table 2). In unadjusted analyses, Latinos (23%) and African Americans (17%) were more likely to have decreased medication use due to cost, compared to whites (13%), Asian/Pacific Islanders (11%), and others (15%) (Table 2). In multivariate analyses, race/ethnicity remained a significant (p=0.048) predictor of cost-related medication underuse, as did lower income, lack of drug coverage, having higher out-of-pocket drug costs, being younger, female, and reporting poorer health status (Table 2). However, in comparing adjusted rates, cost-related medication underuse was only slightly higher for Latinos (14%) compared to whites (10%) (p=0.026), and was not significantly different for African Americans (11%), Asian/Pacific Islanders (7%), and other (11%) (Table 3). The greatest differences in adjusted rates of cost-related underuse were observed between those with incomes less than $25K versus income greater than $50K (15% vs. 5%), out-of-pocket drug costs greater than $150/month versus out-of-pocket drug costs of $50/month or less (24% vs. 7%), and in patients ages 18-44 years old versus ages 65 years or older (23% vs. 6%).

CONCLUSIONS

In this large, insured, racially diverse population of adults with diabetes, 1 in 7 respondents reported cost-related medication underuse. Given the high rates of cost-related medication underuse, even among an insured population, efforts to decrease financial barriers to medications for persons with diabetes are clearly still needed. Since one-fourth of our participants had medical coverage but not drug benefits, one consideration would be to tie drug benefits closer to medical coverage by not offering them separately but only as a combined

benefit for those with chronic diseases such as diabetes.

To our knowledge, ours is the first study to report cost-related medication underuse for three primary racial/ethnic minorities: Latinos, African Americans, and Asian/Pacific Islanders. In unadjusted rates, cost-related medication underuse was much higher among Latinos (23%) and African Americans (17%) compared to whites (13%). Thus, cost-related medication nonadherence could be an important contributor to racial/ethnic disparities in diabetes in the sense that general medication nonadherence is associated with greater diabetes-related morbidity (9, 15, 16-18) and mortality (15). In our study, these racial/ethnic differences in rates of cost-related medication nonadherence were minimal after adjusting for economic, health, and other demographic variables. Latinos remained the only group to be significantly different from whites, and this difference in adjusted rates of cost-related medication underuse (4%) was less than those observed across categories of income (10%), out-of-pocket drug costs (17%), and age (17%). Additionally, the two-way interaction terms of "race/ethnicity by income" and "race/ethnicity by out-of-pocket drug costs" were not found to be significant predictors of cost-related underuse. These results indicate that a potential reason why we found higher rates of cost-related medication underuse among certain racial/ethnic minorities may be more due to the lower income levels and higher out-of-pocket drug costs faced by these racial/ethnic minorities, and less due to racial/ethnic differences in responding to cost-pressures when it comes to medication nonadherence. Therefore interventions to decrease racial/ethnic disparities in cost-related medication underuse should focus on decreasing financial barriers to medications. As an example, Latinos and African Americans were also the least likely to have drug coverage in our study, and this was a strong predictor of cost-related nonadherence. Since all our participants had health insurance, an important policy question would be to examine whether certain minorities are less likely to have access to drug benefits or are more likely to choose health coverage without drug benefits.

Our finding that race/ethnicity is a significant but weak independent predictor of cost-related underuse would explain why the general literature on cost-related medication underuse (not necessarily in persons with diabetes) has been split on race/ethnicity as a significant, independent predictor (24). We examined designs of previous studies, looking for commonalities in studies that did/did not find an association between race/ethnicity and cost-related medication underuse, and found no patterns in whether studies controlled for economic variables (which nearly all have), reported on only white vs. non-white groups (11,19,20,27), and/or included African Americans (14, 19, 21), Latinos (14, 23, 27) or Asian/Pacific Islanders separately. We know of only two earlier studies of cost-related medication underuse that included large numbers of patients with diabetes and reported on race/ethnicity (11, 14). Piette, et al. studied only white vs. non-white (11), and Mojtabai et al. studied African Americans and Latinos, but not Asian/Pacific Islanders as a separate group (14). Neither study found race/ethnicity to be a significant predictor after adjusting for economic variables (e.g. income). Again, this supports targeting financial barriers to medications to improve medication adherence, and targeting specific racial/ethnic groups if these financial barriers are more likely to exist within them.

We do not know why, after controlling for economic, health, and other demographic variables, Latinos would be at higher risk for cost-related underuse in our study. Language barrier is a reasonable hypothesis. However, too few of our Latino respondents (15%, n=105) completed the survey in Spanish for

us to analyze Spanish language as an independent predictor and we also did not measure patient-provider language concordance. Clearly further work in this area would be important to address this component of cost-related medication underuse attributed to race/ethnicity.

In this study, we also found younger age, female gender, being prescribed more medications, and poorer health status to be significantly correlated with cost-related medication underuse, independent of patients' medication costs and income. This is consistent with other studies (11,20,22, 24) and points to the need for further investigations to determine why these groups are more cost-sensitive. For example, patients in poorer health or who are prescribed more medications are potentially among those most vulnerable to any negative health impacts of medication cost-cutting. Like other studies we found that age was one of the strongest correlates of cost-related medication non-adherence (11,20,22, 24), with 23% of the youngest group (ages 18 to 44 years) versus 6% of those 65 and older reported cost-related medication underuse. We can only speculate why age is consistently such a strong determinate of cost-related medication non-adherence. A possible explanation could be that younger patients may face greater competing financial demands (excluding out-of-pocket prescription costs which we controlled for), have fewer financial assets (excluding income), have greater time demands, or may be less worried about diabetes related complications.

Limitations to this study are that all of our participants were in managed care and had health insurance and our findings may not be generalizable to uninsured populations. However, over 92% of patients with diabetes have some form of health insurance (28). It is reasonable to assume that financial barriers for uninsured persons would be as strong or even a stronger predictor of cost-related medication underuse. A limitation of this study is that we relied on self-reported medication underuse. Clearly, there is the potential for bias in reporting due to recall error (under or over-reporting) or reluctance to admit to nonadherence with treatment (under-reporting). To date, nearly all major surveys of cost-related medication underuse rely on self-reporting alone (24). We are not aware of any large scale published studies that have measured the validity of cost-related medication underuse by self-report through comparison with claims data. Self-reporting of cost-related medication underuse has some advantages over claims data analyses – participants can be asked to report underuse specifically due to cost, whereas claims data may not fully distinguish between cost-related nonadherence and nonadherence due to side-effects or perceived lack of treatment effectiveness In our study, we framed the question in a very clear manner asking participants to report underuse specifically to *cost* in the last 12 months. Our study is also a cross-sectional analysis of a longitudinal cohort with potential participants lost to follow up, death, or ineligibility including admission to nursing homes. The cross-sectional nature of the study allows us to measure associations and not causality.

In conclusion, this study confirms that cost remains a significant reason for treatment nonadherence even in an insured population. Although rates of cost-related medication underuse differed by race/ethnicity, our results suggest that reducing financial barriers to medications would be an important and effective way to address this.

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TABLE 1. Participant Demographics*, 1 of 2 cont.

Race/Ethnicity	Latino	African American	White	Asian/ Pacific Islander	Other	Total
n	**736**	**707**	**2452**	**782**	**410**	**5086**
	(%)	(%)	(%)	(%)	(%)	(%)
% of total population	14	14	48	15	8	100
Age (years)	65.2	63.3	65.5	61.7	63.2	64.4
18-44	6	7	5	7	7	6
45-64	43	47	42	55	45	45
65+	51	46	52	39	48	49
Female	56	71	50	52	53	54
Education						
< High School	39	25	13	8	16	18
High school grad	26	35	29	28	34	29
Some college or higher	36	40	58	65	51	53
Annual household income						
< $25,000	53	62	36	24	40	40
$25,000 to $49,999	25	21	27	31	27	26
$50,000+	22	17	38	45	33	33

* Percentages may not add to 100% due to rounding errors

TABLE 1. Participant Demographics*, cont. 2 of 2

Race/Ethnicity	Latino	African American	White	Asian/ Pacific Islander	Other	Total
n	**736**	**707**	**2452**	**782**	**410**	**5086**
	(%)	(%)	(%)	(%)	(%)	(%)
Health						
excellent/ very good	18	13	22	20	18	20
good	39	36	44	45	46	43
fair/poor	43	50	34	35	36	38
Has prescription drug benefit (yes)	67	67	72	82	74	72
Number of medications						
1 to 5 meds	41	49	57	41	54	51
6 or more meds	59	51	43	59	46	49
Average monthly out-of-pocket drug costs						
$50 or less per month	45	58	50	54	49	51
$51 to $100 per month	24	19	24	25	26	23
$101 to $150 per month	15	9	10	10	8	10
Greater than $150 per month	17	14	16	11	17	15

* Percentages may not add to 100% due to rounding errors

TABLE 2. Unadjusted and Adjusted Predicted Percents for Cost-Related Medication Underuse†, 1 of 3 cont.

	Reported cost-related medication underuse			
	Unadjusted Percent (%)	Adjusted Predicted Percent (%) (95% CI)		P-value of Variable in Adjusted Model
All participants (n=5086)	14	14		
Race/Ethnicity				**0.048**
White [reference] n=2452	[13]	[10]	(8, 12)	
African American n=707	17	11	(8, 13)	
Latino n = 736	23	14*	(10, 18)	
API n = 782	11	7	(5, 10)	
Other n = 410	15	11	(6, 15)	
Age (years)				**<.001**
18-44	24	23*	(17, 29)	
45-64	17	15*	(13, 18)	
65+ [reference]	[10]	[6]	(5, 7)	
Sex				**<.001**
Female	18	12*	(10,14)	
Male [reference]	[11]	8	(7,10)	

TABLE 2. Unadjusted and Adjusted Predicted Percents for Cost-Related Medication Underuse†, 2 of 3 cont.

	Reported cost-related medication underuse			
	Unadjusted Percent (%)	Adjusted Predicted Percent (%) (95% CI)		P-value of Variable in Adjusted Model
Education				0.28
< High School	15	9	(7, 11)	
High School Graduate	17	11	(9, 13)	
Some college or higher [reference]	[13]	[10]	(8, 12)	
Annual Household Income				**<.001**
< $25,000	20	15*	(12, 18)	
$25,000 to $49,999	16	12*	(9, 14)	
$50,000+ [reference]	[7]	[5]	(4, 7)	
Health Status				**<.001**
excellent/very good [reference]	[8]	[7]	(5, 9)	
good	12	9*	(7, 11)	
fair/poor	20	14*	(11, 16)	
Has prescription drug benefit				**<.001**
yes [reference]	[13]	[9]	(8, 11)	
no	19	13*	(10, 16)	
Number of prescription medications				**<.001**
1-5 meds [reference]	[14]	[9]	(7, 11)	
6 +	15	11*	(9, 13)	

TABLE 2. Unadjusted and Adjusted Predicted Percents for Cost-Related Medication Underuse†, 3 of 3

	Reported cost-related medication underuse			
	Unadjusted Percent (%)	Adjusted Predicted Percent** (%) (95% CI)		P-value of Variable in Adjusted Model
Ave. monthly out-of-pocket drug costs				**<.001**
$50 or less per month [reference]	[9]	[7]	(5, 8)	
$51 to $100 per month	14	11*	(9, 14)	
$101 to $150 per month	20	16*	(12, 19)	
> $150 per month	29	24*	(20, 29)	

* Statistically significant at $P < 0.05$

† The model included race/ethnicity, income, whether a patient had prescription drug benefits, and average monthly out-of-pocket drug costs as main predictors. The remaining variables were included as covariates: age, gender, education, self-reported health status, and the number of prescription medications. Duration of diabetes and four two-way interaction terms (race/ethnicity by age, gender, income, and out-of-pocket drug costs) were assessed, but were not significant and were not included in the final model for reasons of parsimony

FIGURE 1. Analytic sample and response rate.