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# Racial Disparities in Access After Regulatory Surveillance of Benzodiazepines

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**Background:** We examined the effects of a prescription-monitoring program on benzodiazepine access among Medicaid enrollees living in neighborhoods of different racial composition.

**Methods:** We used interrupted time series and logistic regression to analyze data from noninstitutionalized persons aged 18 years or older (N = 124 867) enrolled continuously in New York Medicaid 12 months before and 24 months and 7 years after initiation of the program. We used census data to identify the racial composition of the neighborhoods. Outcome measures were nonproblematic use (short term, within dosing guidelines), potentially problematic use (>120 days' use or more than twice the recommended dose), and pharmacy hopping (filling prescriptions for the same benzodiazepine in different pharmacies within 7 days).

**Results:** There was a sudden, sustained reduction in benzodiazepine use in all the neighborhoods after the program's introduction. Despite the lowest rates of baseline use, enrollees in predominantly ( $\geq 75\%$ ) black neigh-

borhoods experienced the highest rates of discontinuation after introduction of the program. This difference remained 7 years after policy initiation. Compared with white participants, black participants were more likely to discontinue nonproblematic (odds ratio, 1.78; 95% confidence interval, 1.47-2.17) and potentially problematic (odds ratio, 1.77; 95% confidence interval, 1.45-2.17) benzodiazepine use, after adjusting for sex, eligibility status, neighborhood poverty, and baseline use. The program almost completely eliminated pharmacy hopping in all racial groups, although less among white participants (82.6%) vs black participants (88.7%).

**Conclusions:** A systematic benzodiazepine prescription-monitoring program reduced inappropriate prescribing, with a stronger effect in predominantly black neighborhoods despite lower baseline use. The policy may have resulted in an unintended decrease in nonproblematic use that disproportionately affects black populations.

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**I**N THE UNITED STATES, THERE ARE wide racial variations in patterns of medical care and health outcomes. Blacks are less likely than whites to receive a range of medical services, including potentially life-saving surgical procedures.<sup>1-9</sup> Blacks also use fewer prescribed medications across most therapeutic categories,<sup>10-12</sup> with the greatest differences seen in psychotropic medications.<sup>11,13-15</sup> The reasons for racial disparities in utilization are not well understood but are likely to be multifactorial. The phenomenon remains after adjusting for potential confounding factors, such as differences in socioeconomic status, health status, and health insurance coverage.<sup>6,9,10,12,16</sup> Some researchers<sup>8,15,17,18</sup> have suggested that variations may be attributed in part to the racial biases of health care providers. Despite the

burgeoning literature on racial disparities in health care, few studies have examined racial differences in the impact of a health policy change.

Health care payers commonly introduce surveillance of physicians' prescribing to reduce inappropriate use. Triplicate prescription programs (TPPs), which require physicians to order certain drugs on multiple copy forms, or their electronic counterparts, are currently used in 17 states to reduce diversion and abuse of controlled prescription drugs.<sup>19,20</sup> In January 1989, New York became the first state to include benzodiazepines in its TPP. Subsequently, 6 more states have included benzodiazepines in their prescription-monitoring programs.<sup>20</sup>

Benzodiazepines are widely prescribed and effective treatments when used appropriately for anxiety, panic, sleep, and

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seizure disorders.<sup>16</sup> However, there is controversy about their risk of dependency and abuse.<sup>21,22</sup> Generally, benzodiazepine use for a long duration, at higher than recommended doses, or with evidence of abuse can be considered potentially problematic.<sup>16,23,24</sup> These concerns have motivated regulatory efforts to curb inappropriate use and abuse.

A recent well-controlled study<sup>25</sup> examining the effects of the New York TPP showed greater reductions in benzodiazepine use by residents in predominantly black ZIP codes after introduction of the policy. An earlier small, uncontrolled study<sup>26</sup> suggested that elderly black Medicaid recipients experienced greater declines after introduction of the TPP than nonblacks. However, neither study examined other racial minorities; controlled for differences in possible confounders, such as income; examined problematic vs nonproblematic use; or investigated pharmacy or physician behaviors that may have resulted in racial bias.

In this study, we examine benzodiazepine use in black, white, Hispanic, and racially mixed neighborhoods and establish the independent contribution of neighborhood racial composition as a predictor of benzodiazepine use and discontinuation after introduction of the TPP, controlling for sex, socioeconomic status, age, category of Medicaid eligibility, and urban residence. We also examine whether there is a differential response to the TPP by physicians and pharmacies in neighborhoods of different racial composition.

## METHODS

### STUDY SETTING AND PARTICIPANTS

In January 1989, New York State added benzodiazepines to their existing TPP for controlled substances. We examined the impact of the policy using a 25% random sample of New York Medicaid enrollees 12 months before and 24 months after introduction of the benzodiazepine TPP. We also assessed long-term effects by observing rates of benzodiazepine use in 1995, 7 years after the policy was initiated. This study includes Medicaid enrollees in 3 categories: Aid to Families with Dependent Children, Old Age Assistance, and Aid to the Permanently and Totally Disabled. We excluded enrollees younger than 19 years because pediatric benzodiazepine use is rare. Nursing home residents were also excluded because data on their medication use were not available. To control for interrupted enrollment or changing case-mix across time,<sup>27,28</sup> we identified patients who were enrolled continuously in Medicaid ( $\geq 10$  of every 12 months during the initial study period). To assess long-term effects, we identified a similarly defined cohort of New York Medicaid enrollees in 1995. To examine response to the TPP by physicians in different neighborhoods, we restricted analyses to all prescriptions by physicians who had written at least 10 benzodiazepine prescriptions dispensed to members of the study cohort 1 year before and after initiation of the TPP.

### DATA SOURCES AND VARIABLES

Data were extracted from monthly enrollment, health care provider, inpatient, ambulatory service, and drug claim files in the computerized Medicaid Management Information System. Enrollee characteristics included age, sex, category of Medicaid eligibility, and ZIP code of residence. Data on enrollee race were

not available. The ZIP codes of physician practices and dispensing pharmacies were obtained from the health care provider file in the Medicaid Management Information System.

Data on prescriptions filled included the National Drug Code, dispensing date, units dispensed, and identification codes of the dispensing pharmacy and prescribing physician (identifiable in 73% of claims in our cohort). National Drug Codes were cross-referenced to data on ingredients, therapeutic class, and dosage using the First Databank National Drug Data File Plus<sup>29</sup> and the Food and Drug Administration National Drug Code Directory.<sup>30</sup> Medicaid drug data have been shown to be reliable and valid for individual drugs and broader therapeutic classes.<sup>31-33</sup>

We identified clinically vulnerable (at-risk) patients with schizophrenia, seizure disorder, or bipolar illness, conditions for which benzodiazepines represent first-line or important adjunctive therapy.<sup>34</sup> For these conditions, we included patients with at least 1 inpatient or 2 outpatient diagnoses in the year before introduction of the TPP, a validated strategy for defining chronic mental health problems.<sup>35</sup> Patients with bipolar illness had at least 1 inpatient diagnosis or 1 or more prescriptions for lithium (used almost exclusively to treat bipolar illness).<sup>36</sup> Diagnoses were based on the *International Classification of Diseases, Ninth Revision, Clinical Modification*, codes for schizophrenia (codes 295.00-295.99 and 301.20-301.29), seizure disorder (codes 345.00-345.99), and bipolar disorder (codes 296.40-296.89).<sup>37</sup>

We used 1990 US census data to characterize the socioeconomic profiles of ZIP codes.<sup>25</sup> Racial composition was characterized as predominantly black ( $\geq 75\%$  black residents) or white ( $\geq 75\%$  white residents). We classified neighborhoods as majority Hispanic if 50% or more of the residents reported Hispanic ethnicity; there was no overlap between majority Hispanic and predominantly white or black neighborhoods. The remaining ZIP codes that fell into none of these categories were characterized as racially mixed neighborhoods. Neighborhoods were characterized as entirely urban if 100% of the residents lived in an urban area. We developed a poverty index that characterized ZIP codes as low poverty ( $< 50$ th percentile of state ZIP codes in the percentage of households with annual incomes  $< \$15\,000$ ), medium poverty (50th-89th percentile), or high poverty ( $\geq 90$ th percentile).

### INDICATORS OF BENZODIAZEPINE USE

Use was defined as filling at least 1 benzodiazepine prescription during a given year. We used indicators of potentially problematic benzodiazepine use developed by our Clinical Advisory Panel in a previous study.<sup>25</sup> One indicator of potentially problematic benzodiazepine use, *pharmacy hopping*, was defined as filling a prescription for the same benzodiazepine in 2 different pharmacies within 7 days. In addition to pharmacy hopping, benzodiazepine use for longer than 120 days or at dose levels more than twice the recommended maximum (ie,  $> 20$  diazepam milligram equivalents for persons aged  $\geq 65$  years and  $> 40$  diazepam milligram equivalents for younger adults) was considered potentially problematic.<sup>16,23,24</sup> Conversely, short-term benzodiazepine use, within dosing guidelines and with no indication of abuse, was considered nonproblematic. Finally, we calculated the total number of days of benzodiazepine use in the baseline year as an indicator of intensity of use.

### DATA ANALYSIS

We first examined the demographic characteristics of enrollees living in neighborhoods with different racial characteristics and their baseline prevalence of problematic and nonprob-

**Table 1. Demographic Characteristics of the Study Population According to Neighborhood of Residence\***

Demographic Characteristic	Predominantly Black (n = 12 054)†	Majority Hispanic (n = 24 071)‡	Predominantly White (n = 45 222)†	Racially Mixed (n = 43 520)	Total (N = 124 867)
Sex					
F	82.5	84.6	73.8	79.2	78.6
M	17.5	15.4	26.2	20.8	21.4
Age, y					
19-44	49.4	56.4	43.4	48.1	48.1
45-64	20.7	20.3	20.3	21.1	20.6
≥65	30.0	23.4	36.3	30.8	31.3
Eligibility					
AFDC	41.5	51.7	25.1	38.5	36.5
Disabled	30.3	26.0	42.5	33.1	34.9
Aged	28.1	22.3	32.4	28.4	28.7
Urban status					
100% Urban	100.0	100.0	53.9	95.7	81.8
Poverty index§					
Low density	11.4	0	43.1	8.4	19.7
Medium density	27.9	4.5	48.1	45.7	36.9
High density	60.7	95.5	8.8	45.9	43.4
Risk group					
Schizophrenia	2.6	1.9	3.8	3.4	3.2
Bipolar disorder	0.4	0.5	1.7	1.1	1.1
Seizure disorder	0.7	0.9	1.0	0.9	0.9

Abbreviation: AFDC, Aid to Families with Dependent Children.

\*Data are given as percentages.  $P < .05$  by  $\chi^2$  test for all neighborhood race group differences.

†Living in ZIP codes where 75% or more of the residents report black or white race.

‡Living in ZIP codes where 50% or more of the residents report Hispanic ethnicity.

§Low density, living in a ZIP code in less than the 50th percentile of all ZIP codes in the state in percentage of households with annual incomes of less than \$15 000; medium density, 50th-89th percentile; and high density, 90th percentile or greater.

||One primary diagnosis in inpatient claims or 2 diagnoses in outpatient claims for defining the condition.

lematic benzodiazepine use, stratified by demographic characteristics and at-risk groups. We next determined benzodiazepine discontinuation rates in the year after introduction of the TPP among patients receiving at least 1 benzodiazepine during the previous year. We also compared rates of benzodiazepine use 7 years after initiation of the TPP.

We used interrupted time-series regression analysis<sup>27,38,39</sup> to estimate changes in levels of and trends in monthly benzodiazepine use stratified by neighborhood racial characteristics, controlling for preexisting trends. Autocorrelation was corrected in all models using the SAS Autoreg procedure.<sup>40</sup>

We used multivariate logistic regression analyses to establish the independent contribution of neighborhood of residence as a predictor of baseline use and discontinuation after initiation of the TPP. In analyses involving at-risk patient cohorts, all use was considered clinically justified. These models controlled for sex, age (Old Age Assistance enrollment), disability (Aid to the Permanently and Totally Disabled enrollment), and poverty level. The discontinuation models also controlled for days of baseline use. All multivariate analyses were limited to individuals living in urban neighborhoods; although Medicaid enrollees in all racial groups live outside of urban areas, there were no nonurban ZIP codes classified as predominantly black or majority Hispanic.

To examine the differential response by health care providers, we computed the number of benzodiazepine claims dispensed to our cohort in the year before and after introduction of the TPP in each of 64 unique cross-classified enrollee/prescriber/pharmacy ZIP code racial categories. For example, we calculated the number of claims filled by enrollees living in black neighborhoods that were prescribed by physicians practicing in white neighborhoods and filled in pharmacies in racially mixed neighborhoods, and so forth. We then computed the before-after percentage reductions in the number of claims

in each category and used linear regression to examine enrollee, prescriber, and pharmacy neighborhood race categories as predictors of these reductions. Thus, estimates of the impact of each factor are adjusted for the other 2 factors.

## RESULTS

### DEMOGRAPHIC CHARACTERISTICS

Of 125 837 continuously enrolled Medicaid recipients who met the cohort eligibility criteria, 124 867 (99.2%) had ZIP code of residence identified (**Table 1**). Enrollees were predominantly women (78.6%), in urban areas (81.8%), and living in predominantly black (9.7%), Hispanic (19.3%), white (36.2%), or racially mixed (34.9%) neighborhoods. Enrollees in white neighborhoods were much more likely to be from nonurban and low-density poverty areas and were much less likely to be enrolled in Aid to Families with Dependent Children. Hispanic enrollees were most likely to live in low-income neighborhoods. Overall, 4.6% of the patients were members of at least 1 clinically vulnerable at-risk group, with schizophrenia (3.2% of patients) accounting for the largest proportion.

### BASELINE BENZODIAZEPINE USE

Baseline rates of benzodiazepine use were associated with neighborhood of residence (**Table 2**). Black neighborhood residents had the lowest rates of baseline use (147

**Table 2. Rate of Baseline Benzodiazepine Use and Percentage of Baseline Users Discontinuing Benzodiazepine Use After Initiation of the TPP**

Demographic Characteristic	Baseline Rate of Use, per 1000 enrollees				Discontinuing Use After the TPP, %			
	Black*	Hispanic*	White*	Mixed	Black*	Hispanic*	White*	Mixed
Overall	147†	235†	202†	200†	73.9†	73.8†	44.9†	62.5†
Sex								
M	160†	217†	176†	180†	71.9†	72.2†	44.9†	60.9†
F	145†	238†	212†	205†	74.3†	74.1†	44.8†	62.8†
Age, y								
19-44	97†	176†	131†	142†	81.2†	80.7†	50.2†	71.6†
45-64	238†	348†	278†	283†	72.0†	69.1†	42.1†	60.5†
≥65	169†	279†	246†	233†	68.8†	68.5†	43.2†	55.5†
Eligibility								
AFDC	94†	182†	105†	137†	85.5†	81.7†	60.0†	77.3†
Disabled	204†	301†	227†	245†	70.4†	68.6†	41.4†	58.0†
Aged	165†	280†	246†	231†	68.8†	68.5†	44.1†	56.1†
Urban status								
100% Urban	147†	235†	232†	201†	73.9†	73.8†	49.0†	63.1†
<100% Urban	NA	NA	168†	158†	NA	NA	38.1†	43.3†
Poverty index*								
Low density	113†	NA	202†	183†	68.4†	NA	41.9†	47.3†
Medium density	158†	241†	206†	211†	76.7†	67.2†	47.3†	60.2†
High density	149†	234†	181†	191†	73.3†	74.1†	45.8†	67.6†
Risk group*								
Schizophrenia	272†	471†	427†	406†	75.0†	65.8†	44.6†	55.2†
Bipolar disorder	208†	409†	363†	401†	45.5	59.6	41.0	46.0
Seizure disorder	307	243	246	278	66.7	72.6	50.5	62.4

Abbreviations: AFDC, Aid to Families with Dependent Children; NA, not applicable; TPP, triplicate prescription program.

\*See definitions in Table 1.

† $P < .05$  by  $\chi^2$  test for neighborhood race group differences.

per 1000 enrollees), and Hispanic neighborhood residents had the highest rates (235 per 1000 enrollees).

Overall, 42.8% of enrollees were identified as potentially problematic users, with use for longer than 120 days (40.2% of users) being the predominant problem. Individuals residing in predominantly black (34.5%) and Hispanic (33.7%) neighborhoods were least likely and those in white (51.6%) and racially mixed (41.1%) neighborhoods were most likely to demonstrate potentially problematic use. Residents in Hispanic and racially mixed neighborhoods had slightly higher overall rates of pharmacy hopping than those in black or white neighborhoods (19.4, 16.8, 13.5, and 12.8 per 1000 enrollees, respectively).

#### IMPACT OF THE TPP ON BENZODIAZEPINE USE

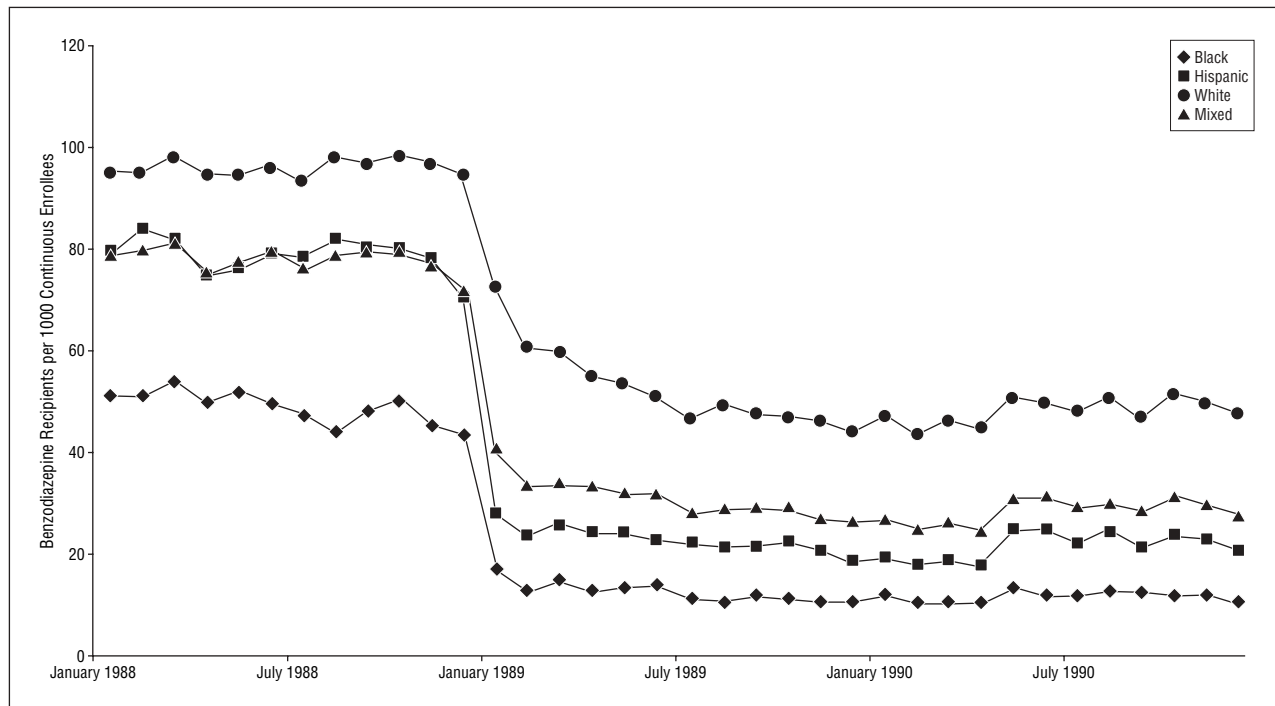
After initiation of the TPP, there were dramatic and sustained declines in benzodiazepine use in all the racial groups (**Figure**). Discontinuation rates were associated with neighborhood racial composition (Table 2). Black benzodiazepine recipients were discontinued at the highest rates (73.9% of baseline users), despite having the lowest rates of baseline use. Discontinuation among Hispanics was comparable (73.8%). Discontinuation among benzodiazepine recipients from white neighborhoods was substantially lower (44.9%). Neighborhood-related patterns of discontinuation were consistent across sex, age, eligibility category, urban location, and poverty level. However, among the clinically at-risk groups, race-related differences were observed only in the schizophrenia cohort.

The racial disparities in benzodiazepine use after introduction of the TPP were maintained 7 years later. Among Medicaid enrollees in 1995, 77 per 1000 enrollees in white neighborhoods filled a benzodiazepine prescription compared with 20, 33, and 46 per 1000 enrollees in black, Hispanic, and racially mixed neighborhoods, respectively. The TPP almost completely eliminated benzodiazepine pharmacy hopping, with more than 83% of participants who exhibited baseline pharmacy hopping discontinuing across all demographic strata. Despite relatively lower baseline rates, pharmacy hopping among black residents was discontinued at a higher rate than among white residents (88.7% vs 82.6%).

#### PREDICTORS OF BENZODIAZEPINE USE AND DISCONTINUATION

After adjusting for sex, enrollment category, and poverty density, neighborhood racial composition remained a powerful predictor of nonproblematic and potentially problematic baseline use and discontinuation after TPP initiation (**Table 3**). At baseline, enrollees living in black neighborhoods had significantly lower adjusted odds of nonproblematic benzodiazepine use than those in white neighborhoods (odds ratio [OR], 0.81; 95% confidence interval [CI], 0.75-0.87), and even lower odds of potentially problematic use (OR, 0.43; 95% CI, 0.39-0.48). Nevertheless, black neighborhood residents had much higher adjusted odds of discontinuation after introduction of the TPP in potentially problematic use (OR, 1.77; 95% CI, 1.45-2.17) and nonproblematic use (OR,





**Figure.** Reductions in benzodiazepine use after initiation of the triplicate prescription program among patients living in neighborhoods with different racial compositions.

**Table 3. Adjusted Demographic Predictors of Baseline Nonproblematic and Potentially Problematic Benzodiazepine Use and Discontinuation of Benzodiazepine Use After Initiation of the TPP\***

Demographic Predictor	Odds Ratio (95% CI)			
	Nonproblematic Use (n = 102 145)	Potentially Problematic Use (n = 102 145)	Discontinuation of Nonproblematic Use (n = 12 706)†	Discontinuation of Potentially Problematic Use (n = 8742)†
Neighborhood				
Predominantly black‡	0.8 (0.8-0.9)§	0.4 (0.4-0.5)§	1.8 (1.5-2.2)§	1.8 (1.5-2.2)§
Majority Hispanic‡	1.5 (1.4-1.6)§	0.8 (0.7-0.8)§	1.6 (1.3-1.9)§	1.5 (1.2-1.7)§
Racially mixed (vs predominantly white‡)	1.0 (1.0-1.1)	0.7 (0.7-0.8)	1.2 (1.1-1.4)§	1.2 (1.0-1.3)§
Sex				
Female (vs male)	1.5 (1.4-1.6)§	1.4 (1.3-1.5)§	0.9 (0.8-1.1)	0.9 (0.8-1.0)§
Eligibility				
Disabled	1.5 (1.4-1.6)§	4.2 (3.9-4.4)§	0.6 (0.6-0.7)§	0.8 (0.7-0.9)§
Aged (vs AFDC)	1.6 (1.5-1.7)§	3.0 (2.8-3.2)§	0.5 (0.5-0.6)§	0.7 (0.6-0.8)§
Poverty index‡				
Medium density	1.3 (1.2-1.4)§	1.3 (1.2-1.3)§	1.5 (1.3-1.7)§	1.6 (1.4-1.8)§
High density (vs low density)	1.2 (1.1-1.3)§	1.3 (1.2-1.4)§	1.7 (1.5-2.0)§	2.1 (1.8-2.5)§

Abbreviations: AFDC, Aid to Families with Dependent Children; CI, confidence interval; TPP, triplicate prescription program.

\*Adjusted for sex, enrollment category, and poverty density; discontinuation models were also adjusted for the number of days of baseline use.

†Models also adjusted for number of days of baseline use.

‡See definitions in Table 1.

§P < .05.

1.78; 95% CI, 1.47-2.17). Residents in Hispanic and racially mixed neighborhoods also exhibited lower baseline odds of potentially problematic benzodiazepine use compared with those in white neighborhoods but higher odds of discontinuation of problematic and nonproblematic use.

Furthermore, lower adjusted odds of pharmacy hopping were observed at baseline among residents of black (OR, 0.67; 95% CI, 0.55-0.82), Hispanic (OR, 0.92; 95% CI, 0.78-1.10), and racially mixed neighborhoods (OR,

0.85; 95% CI, 0.74-0.97) compared with white neighborhoods. Despite lower baseline odds of this behavior, residents in black (OR, 3.16; 95% CI, 2.04-4.90), Hispanic (OR, 1.61; 95% CI, 1.10-2.33), and racially mixed (OR, 1.48; 95% CI, 1.08-2.01) neighborhoods had greater odds of discontinuing pharmacy hopping than those in white neighborhoods.

Finally, patients with schizophrenia in black (OR, 0.43; 95% CI, 0.32-0.58) and racially mixed (OR, 0.78; 95% CI, 0.64-0.94) neighborhoods experienced lower ad-

**Table 4. Adjusted Impact of Neighborhood Racial Composition on Baseline Benzodiazepine Use and Discontinuation of Benzodiazepine Use After Introduction of the TPP Among Members of At-Risk Groups\***

Group	Odds Ratio (95% CI)	
	Baseline Use	Discontinuation of Use
Patients with schizophrenia		
Predominantly black†	0.4 (0.3-0.6)‡	2.3 (1.2-4.2)‡
Majority Hispanic†	1.0 (0.7-1.3)	2.0 (1.2-3.3)‡
Racially mixed	0.8 (0.6-0.9)‡	1.2 (0.8-1.6)
Patients with bipolar disorder		
Predominantly black†	0.4 (0.2-0.8)‡	0.8 (0.2-3.3)
Majority Hispanic†	0.9 (0.5-1.5)	1.1 (0.4-2.7)
Racially mixed	1.1 (0.8-1.5)	1.1 (0.6-1.9)
Patients with seizure disorder		
Predominantly black†	0.9 (0.5-1.6)‡	1.3 (0.4-4.4)
Majority Hispanic†	0.6 (0.3-1.0)	2.1 (0.6-7.3)
Racially mixed	0.7 (0.5-1.2)	1.4 (0.5-3.5)

Abbreviations: CI, confidence interval; TPP, triplicate prescription program.  
\*Enrollees living in predominantly white neighborhoods are the reference group in all the models; all the models were adjusted for patient sex, eligibility category, and neighborhood poverty index, and the discontinuation models were also adjusted for the number of days of baseline use.

†See definitions in Table 1.

‡P<.05.

justed odds of baseline benzodiazepine use compared with those in white neighborhoods (**Table 4**). Despite lower baseline use, black patients with schizophrenia had greater adjusted odds of discontinuation (OR, 2.26; 95% CI, 1.22-4.17) after initiation of the TPP compared with white patients. Patients with schizophrenia from Hispanic neighborhoods also experienced greater adjusted odds of discontinuation (OR, 2.00; 95% CI, 1.23-3.28) compared with white neighborhood residents.

#### IMPACT OF THE TPP ON BENZODIAZEPINE PRESCRIBING AND DISPENSING

After introduction of the TPP there was a 50.0% reduction in the number of benzodiazepines dispensed among residents in white neighborhoods who received benzodiazepines prescribed by physicians and filled by pharmacies in white neighborhoods (**Table 5**). Controlling for physician and pharmacy neighborhood, additional reductions in benzodiazepine use were observed after initiation of the TPP attributable to living in a black (-12.8%) or racially mixed (-5.9%) neighborhood. Furthermore, controlling for these patient differences, there were also additional significant reductions in benzodiazepine use attributable to seeing physicians who practiced in black (-10.1%), Hispanic (-15.5%), and racially mixed (-5.6%) neighborhoods and to filling prescriptions in pharmacies located in black (-25.3%), Hispanic (-16.1%), and racially mixed (-10.3%) neighborhoods.

#### COMMENT

After introduction of the TPP, there was a sudden and sustained reduction in benzodiazepine use and potentially problematic use in all New York neighborhoods.

**Table 5. Reductions in Benzodiazepine Use After TPP Initiation Attributable to the Racial Composition of the Neighborhoods of Enrollees, Physicians, and Pharmacies**

Reduction	Attributable Reduction (95% CI), %*
Reference reduction for patients, physicians, and pharmacies all located in white ZIP codes	-50.0 (-55.7 to -44.2)
Additional reduction attributable to enrollee residence in nonwhite ZIP code	
Predominantly black	-12.8 (-17.9 to -7.6)†
Majority Hispanic	-3.1 (-8.4 to 2.1)
Racially mixed	-5.9 (-11.1 to -0.8)‡
Additional reduction attributable to physician practice location in nonwhite ZIP code	
Predominantly black	-10.1 (-15.3 to -4.9)†
Majority Hispanic	-15.5 (-20.7 to -10.4)†
Racially mixed	-5.6 (-10.7 to -0.4)‡
Additional reduction attributable to pharmacy location in nonwhite ZIP code	
Predominantly black	-25.3 (-30.5 to -20.1)†
Majority Hispanic	-16.1 (-21.4 to -10.9)†
Racially mixed	-10.3 (-15.5 to -5.0)†

Abbreviations: CI, confidence interval; TPP, triplicate prescription program.

\*Based on the regression model predicting percentage reduction in benzodiazepine use attributable to the racial composition of the ZIP code using observed reductions in benzodiazepine dispensing in the 64 possible combinations of patient, physician, and pharmacy ZIP code racial composition.

†P<.01.

‡P<.05.

Despite lower baseline rates of potentially problematic and nonproblematic benzodiazepine use compared with white participants, black participants were more likely to be discontinued after initiation of the TPP. Hispanics, the highest baseline users, also experienced greater reductions in use than white participants after the TPP was in place. Patients with schizophrenia residing in black neighborhoods also experienced the greatest reductions in benzodiazepine use after initiation of the TPP, again despite having the lowest rates of baseline use. Our results remained unchanged after adjusting for the potential confounders of sex, age, eligibility category, urban residence, and poverty level.

We also demonstrated that controlling for enrollee neighborhood of residence, physicians practicing in black and Hispanic neighborhoods were less likely to prescribe benzodiazepines after introduction of the TPP, and pharmacies located in nonwhite neighborhoods were less likely to dispense these drugs. Across all practice and pharmacy locations, black enrollees were consistently the most likely, and white enrollees the least likely, to experience reductions in access to benzodiazepines. Although the dispensing practices of pharmacies after initiation of the TPP are likely to result from the changes in benzodiazepine prescribing of physicians located in surrounding neighborhoods, the degree to which they refused to fill benzodiazepine prescriptions for certain patient groups after introduction of the TPP is unknown.

This study uses one of the strongest quasi-experimental designs (time series with a continuously en-

rolled cohort) to study changes resulting from the TPP. There are, nonetheless, several weaknesses. First, pharmacy claims contain no diagnostic information, so we cannot judge the appropriateness of prescribing decisions. However, the measures of potentially problematic use developed by our Clinical Advisory Panel provide indicators of possible habituation or abuse, in this study measured through pharmacy hopping, which have been the primary clinical concern with this class of drugs. Residents in nonwhite ZIP codes were lower on these baseline measures yet experienced greater reductions after introduction of the TPP than white residents. Furthermore, the findings suggest race-related disparities in benzodiazepine discontinuation in the schizophrenia risk group, where the sudden withdrawal of benzodiazepines is of greater clinical concern.

The absence of race identifiers resulted in a surrogate measure based on ZIP code characteristics. However, as reported elsewhere,<sup>25</sup> this neighborhood measure was strongly correlated with individual race in a similarly defined cohort in New Jersey where race identifiers were available. Although the use of ZIP code-derived measures may have misclassified some patients compared with individual race identifiers or geographic measures at lower levels of aggregation, this would have reduced the likelihood of finding neighborhood-related effects. Finally, we identified the prescribing physician on only 73% of claims, but the proportion with physician identifiers did not vary by the racial composition of the ZIP codes.

Despite its limitations, this study adds to the growing evidence of wide racial variation in patterns of medical care and health service use.<sup>1-14</sup> However, it is the first, to our knowledge, to show that implementing a health policy (which may achieve some of its desired goals) can have an unintended consequence of widening the divide in access to services between people of different racial backgrounds. We also highlight that surveillance policies may result in a differential response by health care providers,<sup>15</sup> at least in the low-income, predominantly female population observed in this study. It remains unclear to what extent these increasing disparities in the use of benzodiazepines are a manifestation of suboptimal care, concern about regulatory scrutiny, or subtle discrimination on the basis of race or other demographic features by physicians or pharmacists.

Although legislators should be satisfied that the TPP almost completely eliminated pharmacy hopping, it is of concern that the weight of the policy has fallen most heavily on patients with the lowest rates of baseline use, and it is further troubling that these recipients were identifiable on the basis of race. It remains unclear how these reductions in access affected enrollees, most of whom seemed to be using benzodiazepines appropriately. This study highlights that the policy may have raised an unintended obstacle to appropriate treatment for some already disadvantaged individuals.

Although the study of racial differences in access to health care is important, it is merely the point of departure for redressing the balance. No single, predominant cause of racial disparities is likely to be identified, and speculating about the relative contributions of different factors should not delay efforts to

correct known disparities in access to appropriate care. Eliminating racial disparities is a long-term challenge that will require social change, redesign of systems of care, and careful examination of the effects of current policy structures.

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