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# Antihypertensive Medication Use:
# Implications for Inequities in Cardiovascular Risk
# and Opportunities for Intervention

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*Abstract:* Antihypertensive medication use protects against adverse health effects of hypertension. Residents of low-income urban communities are disproportionately Black and Latino, and may experience heightened cardiovascular health risks due to reduced medication use. We estimate the odds of antihypertensive medication use by race/ethnicity and socioeconomic position. Data are from the Healthy Environments Partnership Community Survey, restricted to 377 hypertensive participants. Antihypertensive medication use was defined as people with hypertension who were taking antihypertensive medication. Racial/ethnic and socioeconomic differences in medication use were examined using multivariate logistic regression. Odds of antihypertensive medication use were lower for people with incomes 1.00–1.99 times the poverty level (OR=0.75, p=.05) compared with those ≥2.00 times poverty, and for Latinos (OR=0.48, p<.01) and Whites (OR=0.50, p<.01) compared with Blacks. Findings suggest a need to improve hypertension screening and treatment for residents of low- to moderate-income urban communities, with attention to subgroups who may have limited health care access.

*Key words:* Hypertension, antihypertensive medication use, chronic disease, health inequities, health disparities, Hispanic, Latino, non-Latino Black, non-Latino White.

Cardiovascular mortality accounts for 24% of all-cause mortality in the U.S.[1] While cardiovascular mortality rates have declined,[2] racial/ethnic and socioeconomic inequities in cardiovascular risk[3,4] and mortality[5,6] persist. Non-Latino Blacks (NLBs) have higher adjusted odds of hypertension than non-Latino Whites (NLWs), while rates among Latinos are similar to NLWs.[4,7]

Less is known about the social patterning of antihypertensive medication use, an

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important mechanism for reducing inequities in cardiovascular risk. Antihypertensive medication use is protective against longer-term health consequences of hypertension.[8] Residents of low-income urban communities are disproportionately NLB and Latino,[9] and may experience heightened health risks associated with hypertension due to reduced antihypertensive medication use. Thus, communities with untreated hypertension may experience heightened cardiovascular risk over the life course.

We examine racial/ethnic and socioeconomic differences in odds of antihypertensive medication use among people with hypertension, drawing on data from a multiethnic sample residing in low- to moderate-income neighborhoods in Detroit.

## Methods

**Sample**. The Healthy Environments Partnership (HEP), a community-based participatory research partnership, has been working together since 2000 to understand and address the contributions of social and physical environmental factors to inequities in cardiovascular risk in Detroit, Michigan.[10] Data are from the 2002 HEP Community Survey, a stratified, two-stage probability sample of occupied housing units in three geographic areas of Detroit, designed to sample NLB, Latino, and NLW persons aged 25 years and older across socioeconomic strata.[10] The total sample included face-to-face interviews with 919 participants.[10] In addition to self-reported demographic and health data, blood pressure was measured at the time of the interview.[10] Cases are restricted to 377 (41.7%) hypertensive participants, defined as those with systolic blood pressure ≥140 mmHg, diastolic blood pressure ≥90 mmHg, or taking antihypertensive medication. The University of Michigan Institutional Review Board (IRB) approved this study.

**Measures**. The dependent variable, antihypertensive medication use, was defined as people with hypertension who reported taking antihypertensive medication at the time of survey (yes=1, no=0). Independent variables were poverty-to-income ratio (PIR), educational attainment, and race/ethnicity. A three-level version of the PIR (self-reported household income divided by the federal poverty level for 2002, accounting for household size[11]) was used: PIR<1=household income below poverty; PIR of 1.00–1.99=income at or above but less than twice the poverty level; and PIR≥2 (referent)=household income ≥ twice the poverty level. Educational attainment was dichotomized as less than high school education/GED (1=yes, 0=no). Race/ethnicity was coded as NLW, NLB (referent), or Latino (regardless of racial group). Covariates included self-reported gender (male=referent) and age (25–44 (referent), 45–64, ≥65 years).

**Statistical analyses**. Socioeconomic and racial/ethnic differences in antihypertensive medication use were examined using multivariate logistic regression. We employed three age- and gender-adjusted models to evaluate the socioeconomic and racial/ethnic patterning of antihypertensive medication use, progressively including each indicator: The first model regressed antihypertensive medication use on educational attainment and poverty-to-income ratio, controlling for age and gender. The second model regressed antihypertensive medication use on race/ethnicity, controlling for age and gender. The final, full model regressed antihypertensive medication use on both indicators of socioeconomic position (i.e., educational attainment, poverty-to-income ratio) and race/ethnicity, controlling for age and gender. Complex sampling weights

that account for non-response, over-sampling, and post-stratification were applied to each regression model.[10]

## Results

Among hypertensive participants (n=377), Latinos were more likely to be younger, to have less than a high school education, and to have household incomes 1.00-1.99 times the poverty level, compared with NLWs and NLBs (Table 1). Overall, 57.3% of those who met the definition for hypertension were taking antihypertensive medication: 63.2% of NLBs, 51.2% of NLWs, and 43.8% of Latinos.

Odds of taking antihypertensive medication did not differ by education (OR=1.09, p=.49) (Table 2, Model 1). Individuals with incomes 1.00-1.99 times the poverty level (OR=0.69, p=.01) had 31% lower odds of antihypertensive medication use compared with those with incomes ≥2.00 of poverty. There was no difference in odds of antihypertensive medication use between those with incomes below poverty (OR=1.03, p=.79), and those ≥2.00 of poverty.

Latinos (OR=0.47, p<.01) and NLWs (OR=0.50, p<.01) were approximately 50% less

## Table 1.

### WEIGHTED DESCRIPTIVE STATISTICS[a]

| | Full Sample (n=377) | | Non-Latino Black (n=239) | | Latino (n=48) | | Non-Latino White (n=86) | |
|---|---|---|---|---|---|---|---|---|
| | n | % | [n] | % | n | % | n | % |
| Age 25–44 | 105 | 30.1 | 71 | 30.1 | 16 | 39.2 | 16 | 21.1 |
| Age 45–64 | 168 | 41.5 | 110 | 40.5 | 22 | 38.7 | 34 | 46.9 |
| Age 65+ | 104 | 28.4 | 58 | 29.4 | 10 | 22.1 | 36 | 32.0 |
| Female | 249 | 50.6 | 169 | 54.7 | 25 | 37.6 | 52 | 45.4 |
| Non-Latino Black | 239 | 64.3 | | | | | | |
| Latino | 48 | 15.1 | | | | | | |
| Non-Latino White | 86 | 19.3 | | | | | | |
| Household income below poverty | 153 | 41.0 | 101 | 41.1 | 20 | 42.0 | 31 | 40.2 |
| Household income 1.00–1.99 of poverty | 88 | 23.1 | 51 | 20.3 | 16 | 37.4 | 21 | 23.0 |
| Household income ≥ 2 of poverty | 136 | 35.9 | 87 | 38.6 | 12 | 20.6 | 34 | 36.8 |
| Less than high school education | 138 | 39.5 | 77 | 33.2 | 34 | 74.8 | 26 | 33.2 |
| Taking antihypertensive medication | 216 | 57.3 | 151 | 63.2 | 21 | 43.8 | 44 | 51.2 |

*Note*
[a]Proportions are weighted to account for non-response, oversampling, and post-stratification.

**Table 2.**

## ODDS OF ANTIHYPERTENSIVE MEDICATION USE AMONG RESIDENTS WITH HYPERTENSION[A]

| | Model 1[b] | | Model 2[b] | | Model 3[b] | |
|---|---|---|---|---|---|---|
| | OR (95% CI) | p-value | OR (95% CI) | p-value | OR (95% CI) | p-value |
| Less than high school education | 1.09 (0.86, 1.37) | .49 | | | 0.98 (0.76, 1.26) | .87 |
| Household income below poverty | 1.03 (0.81, 1.32) | .79 | | | 1.07 (0.83, 1.37) | .60 |
| Household income 1.00–1.99 of poverty | 0.69 (0.52, 0.92) | .01 | | | 0.75 (0.56, 1.00) | .05 |
| Latino | | | 0.47 (0.34, 0.65) | <.01 | 0.48 (0.34, 0.69) | <.01 |
| Non-Latino White | | | 0.50 (0.38, 0.66) | <.01 | 0.50 (0.38, 0.66) | <.01 |

*Notes*
[a]Models adjust for age and gender.
[b]Referent groups include: high school education or higher, household income ≥2.0 of the federal poverty level, and non-Latino Blacks.

likely to be taking antihypertensive medication than NLBs (Model 2), unadjusted for socioeconomic position. In models with both socioeconomic position and race/ethnicity (Model 3), odds of antihypertensive medication use remained significantly lower for those with incomes 1.00-1.99 of poverty (OR=0.75, p=.05), Latinos (OR=0.48, p<.01), and NLWs (OR=0.50, p<.01). This U-shaped association of household income with antihypertensive medication use is illustrated in Figure 1. Racial/ethnic differences in antihypertensive medication use were not explained by differences in socioeconomic position. Non-Latino Blacks were more likely than either NLWs or Latinos to be taking antihypertensive medication, regardless of socioeconomic position.

## Discussion

We used data from a multi-ethnic sample to examine the socioeconomic and racial/ethnic patterning of antihypertensive medication use in a low- to moderate-income urban community. The prevalence of antihypertensive medication use in this sample (57.3%) was lower than the national average (61.4%) in the same year.[12] Odds of taking antihypertensive medication were lower among those with incomes 1.00–1.99 of the poverty level, Latinos, and NLWs. Below, we discuss the implications of these findings.

Results suggest a U-shaped relationship between household income and antihypertensive medication use. Regardless of race/ethnicity, participants with household
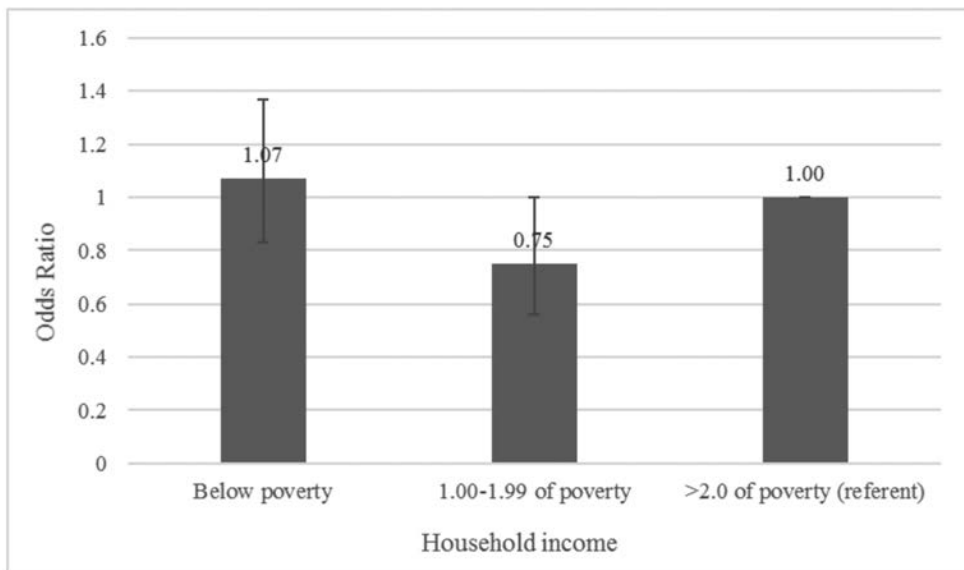
Figure 1. Patterning of antihypertensive medication use by household income.[a]
*Note:* [a]Controlling for age, gender, educational attainment, and race/ethnicity.

incomes 1.00–1.99 of the poverty level had lower odds of antihypertensive medication use than those with incomes below the poverty level and those ≥2.00 of the poverty level. Socioeconomic patterning of health care resources may explain this U-shaped pattern. While we were unable to directly assess the implications of health insurance in this analysis due to limitations of the dataset, in Michigan in 2002, parents with household incomes of up to 63% of the federal poverty line were eligible for Medicaid.[13] As a result, parents in this lowest income category may have had health care access through public insurance programs. Those in the lowest income category were also disproportionately likely to be older, and may have qualified for Medicare. Further examination of the role of access to health insurance in shaping the patterning of antihypertensive medication use would be useful.

We did not find a significant association between education and antihypertensive medication use, above and beyond household income. This may reflect our use of a dichotomous indicator of education (less than high school versus high school completion or more), relatively lower levels of educational attainment in this sample,[14] or suggest that household income more than educational status is associated with antihypertensive medication use. Future studies, with greater variation in educational attainment across racial/ethnic groups to allow use of more graded measures of educational attainment (e.g., less than high school, high school or GED, some college, college or more) may be useful to more thoroughly examine these associations and implications for community health.

Non-Latino Blacks with hypertension in Detroit were taking antihypertensive medication at comparable or slightly higher levels than national estimates in 2002.[12] In comparison, both NLWs and Latinos with hypertension were less likely to be tak-

ing antihypertensive medication than nationally.[12] Even after accounting for income, Latinos and NLWs in Detroit were less likely than NLBs with hypertension to be taking medication. The lower prevalence of hypertension among Latinos and NLWs was thus offset somewhat by lower likelihood of taking antihypertensive medication. It is plausible that health care systems, attuned to excess hypertension risk among NLBs, may enact more rigorous screening and treatment programs within this community. There may also be population differences in access to health care services. For example, 70.8% of Latinos with hypertension in this sample were immigrants, who may experience circumscribed access to health care on the basis of nativity, immigration status, and/or language use.[15,16] Our finding of lower odds of antihypertensive medication use for NLWs relative to NLBs, after accounting for household income and educational attainment, may also reflect limited health care access for this population. Additionally, limited antihypertensive medication use among NLWs relative to NLBs corresponds with recent studies documenting increases in morbidity and mortality for low-income non-Latino Whites.[17]

These findings have several implications for cumulative risk of untreated hypertension for community health. This racial/ethnic and socioeconomic patterning of antihypertensive medication use intersects with the social and economic context of Detroit. For example, high levels of race-based residential segregation in Detroit create an environment in which Latinos are more likely to live close to a source of air pollution, heightening the risk of untreated hypertension. Dvonch, and colleagues report that the effects of air pollution are most acute for residents of neighborhoods most proximate to $PM_{2.5}$ point sources of emissions, which include predominantly Latino neighborhoods.[18] This study found that antihypertensive medication use protected against cardiovascular risks associated with $PM_{2.5}$.[18] Given that Latinos with hypertension may be less likely to be taking antihypertensive medication, and that Latinos in Detroit are more likely to live close to pollution sources, Latinos may be more likely to experience excess cardiovascular risk due to the combined effects of heightened proximity to toxic exposures and lower exposure to protective factors. Thus, communities with untreated hypertension who are proximate to air pollutant sources may experience cumulative vulnerabilities of untreated hypertension that may exacerbate inequities in cardiovascular risk.

**Limitations**. As with all studies, this study is characterized by several limitations. The relatively circumscribed range in socioeconomic position across racial/ethnic groups among participants with hypertension precluded examination of interactions, for example, between socioeconomic position, race/ethnicity, and gender. Second, this dataset did not allow direct tests of the role of health insurance and health care access in the racial/ethnic and socioeconomic patterning of antihypertensive medication use. Third, data from this study precede the implementation of the Affordable Care Act (ACA), which profoundly altered the health care landscape through health insurance expansions and reforms implemented in 2014. These reforms stand to particularly benefit low-income individuals and households, young adults, and those with pre-existing conditions, among others.[19] Additionally, the ACA set in motion a number of incentives and mandates for non-profit hospitals, health departments, and community organizations to collaboratively implement and integrate prevention-oriented initiatives to improve community health.[20] Corresponding with these policy changes, from 2013 to 2015 the

percent of Detroit residents without health insurance declined (2013: 19.4%,[21] 2015: 10.1%[22]). Over this same period, the percent of households with income below poverty increased from 21.7% in 2000[23] to 35.5% in 2015,[24] reflecting decades of economic disinvestment in Detroit[10,25] and the economic recession of 2007–2009. Thus, while health insurance access may have recently improved following health insurance expansions, the proportion of residents below poverty or slightly above poverty has increased substantially over this period. Increases in health insurance coverage—particularly for low-income residents—alongside increases in the percent of residents below poverty may contribute to the persistence or attenuation of our findings suggesting a U-shaped association of household income with antihypertensive medication use. Future studies, drawing on data collected following the implementation of health insurance expansions and reform under the ACA, are warranted to examine whether the U-shaped association of household income with antihypertensive medication use persists.

Of particular interest for future studies are those examining the impact of large-scale community interventions[26] and public policies and services to promote community health,[27,28] such as health insurance expansions under the ACA and enhanced support for community health centers,[29] on the patterns described here. Health insurance expansions may improve access to antihypertensive treatment for many. Because many immigrants are not eligible for health insurance coverage under the ACA, understanding differential implications of such eligibility criteria for antihypertensive medication use among Latinos and, for example, NLWs, is particularly warranted given these findings. Additionally, the incorporation of the social determinants of health into health care practice may improve hypertension screening and treatment for low- to moderate-income and underserved racial/ethnic minority populations.[30]

**Implications**. Despite these limitations, results reported here suggest a need to improve access to hypertension screening and treatment for Latinos and NLWs, residents of low- to moderate-income communities, as well as continued vigilance among NLBs, in urban communities. Further, these findings suggest that relatively modest improvements in income may contribute to improvements in antihypertensive medication use and reductions in cardiovascular risk for communities burdened by hypertension.

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