

Contextual Predictors of Injection Drug Use Among Black Adolescents and Adults in US Metropolitan Areas, 1993–2007

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Objectives. We sought to determine whether contextual factors shape injection drug use among Black adolescents and adults.

Methods. For this longitudinal study of 95 US metropolitan statistical areas (MSAs), we drew annual MSA-specific estimates of the prevalence of injection drug use (IDU) among Black adolescents and adults in 1993 through 2007 from 3 surveillance databases. We used existing administrative data to measure MSA-level socioeconomic status; criminal justice activities; expenditures on social welfare, health, and policing; and histories of Black uprisings (1960–1969) and urban renewal funding (1949–1974). We regressed Black IDU prevalence on these predictors by using hierarchical linear models.

Results. Black IDU prevalence was lower in MSAs with declining Black high-school dropout rates, a history of Black uprisings, higher percentages of Black residents, and, in MSAs where 1992 White income was high, higher 1992 Black income. Incarceration rates were unrelated.

Conclusions. Contextual factors shape patterns of drug use among Black individuals. Structural interventions, especially those that improve Black socioeconomic security and political strength, may help reduce IDU among Black adolescents and adults. (*Am J Public Health*. 2016;106:517–526. doi:10.2105/AJPH.2015.302911)

Contextual factors are increasingly prominent in studies of illegal drug use in the United States. Studies suggest, for example, that neighborhood economic disadvantage predicts illegal drug use,^{1–4} and that local social disorder and unemployment rates predict the prevalence of injection drug use (IDU) in metropolitan areas.⁵

Contextual factors may be especially important to understanding patterns of illicit and licit substance use among Black adolescents and adults.^{6–8} Individual-level characteristics, including psychological states, predict less variance in alcohol and other drug use among Black adolescents and adults than among Whites.^{6–8} Contextual factors may play a stronger role in shaping vulnerability to drug use among Black individuals for at least 2 reasons. First, the United States' racialized social system⁹ amplifies Black individuals' exposure to adverse contextual factors that

create vulnerability to drug use (e.g., high violent crime rates) and diminishes access to protective resources (e.g., high-quality schools).^{10–12} Second, the magnitudes of relationships between contextual factors and drug use may be greater for Black individuals than for Whites.¹³ Jones-Webb et al., for example, found that local poverty rates were

stronger predictors of harmful alcohol use for Black men than for White men.¹⁴

This longitudinal, area-based analysis investigates relationships between contextual factors and the prevalence of IDU among Black individuals (aged 15–64 years) in large US metropolitan areas (MSAs) over time (1993–2007). We focused on determinants of IDU among Black individuals because IDU prevalence appears to be higher in this racial/ethnic group than in others,^{15,16} and because Black injectors are at high risk for HIV and hepatitis C infection and overdose.^{17–19}

This analysis was guided by the Political Ecology of Health, which posits, in part, that social and economic contexts, resources, and collective agency (e.g., social movements to advance racial equality) intersect over time to shape variations in distributions of health and disease across time, space, and populations.^{20–23} On the basis of this model and past research about determinants of drug use among Black adults and other populations,^{1–5,24–28} we studied predictors within the following domains: socioeconomic factors, criminal justice activities, and public expenditures on social welfare and policing. Drawing on sociological research about Black uprisings in the 1960s,^{29–31} we examined relationships of Black uprisings,

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a form of collective agency, to Black IDU prevalence. Guided by Fullilove,^{32–34} we posited that urban renewal programs in 1949 through 1974 might have created long-term vulnerability to IDU in Black communities by disrupting protective social networks and undermining social and political capital.

METHODS

The unit of analysis was the MSA.³⁵ We used 1993 MSA boundaries consistently across the study period. We included all MSAs in the continental United States with population sizes of 500 000 and greater in 1993 ($n = 95$).

Measures

Outcome. As described elsewhere,¹⁵ we calculated Black IDU prevalence as the number of Black injectors per 10 000 Black residents aged 15 to 64 years:

$$(1) \frac{(\text{No. injectors aged 15–64 years who are Black}_{\text{MSA}(Year)}}}{(\text{No. residents aged 15–64 years who are Black}_{\text{MSA}(Year)})} * 10\,000$$

To calculate the numerator, we first estimated the proportion of injectors who were Black in each MSA and year in each of 3 surveillance databases (Figure A, available as a supplement to the online version of this article at <http://www.ajph.org>): the Centers for Disease Control and Prevention’s HIV Counseling and Testing database (CTS), the Substance Abuse and Mental Health Services Administration’s (drug) Treatment Episode data set, and the Centers for Disease Control and Prevention’s National HIV Surveillance System (NHSS) AIDS diagnosis data. We then used binomial mixed-effects regressions to combine these 3 sets of database-specific estimates into a single series of MSA- and year-specific estimates of the proportion of injectors who were Black.¹⁵ Finally, we calculated the number of Black injectors living in each MSA each year by multiplying our estimate of the proportion of injectors who were Black by an estimate of the total number of injectors in each MSA each year, estimates created by using multiplier-allocation methods.¹⁵ The resulting prevalence estimates had good validity: median

correlations between annual Black IDU prevalence estimates and annual rates of drug poisoning and hepatitis C diagnoses among Black adults were 0.51 and 0.60, respectively.¹⁵

Predictors. In addition to histories of uprisings and urban renewal, we examined 3 domains of predictors: MSA-level socioeconomic characteristics, criminal justice activities, and public expenditures on social welfare, health, and policing. In light of racial/ethnic inequalities in the predictors of interest,^{36–40} we calculated Black-specific estimates whenever possible (e.g., poverty rates for households headed by Black adults). Because relationships between Black-specific indicators and the outcome might vary by White-specific indicators, we calculated White-specific indicators whenever possible to investigate interactions.

Socioeconomic characteristics. We calculated the percentage of residents who were Black and racial/ethnic-specific measures of median household income and of rates of household poverty, employment (among individuals aged 16–64 years), and high-school dropout (among adults aged ≥ 26 years) for each MSA by using 1990 and 2000 decennial census data and 2005 to 2009 American Community Survey data.⁴¹ Here and for all predictors whenever relevant, we interpolated intercensal years assuming linear change over time.

Criminal justice activities. We calculated racial/ethnic-specific measures of the number of adults (aged ≥ 16 years) in local jails per 10 000 adults by using 1993, 1999, and 2005 Census of Jails data, and we calculated racial/ethnic-specific measures of the rate of hard-drug arrests per 10 000 adults by using annual Uniform Crime Report data.^{42–45} “Hard drugs” included opium, cocaine, and their derivatives (i.e., heroin, codeine, morphine).

Public expenditures on social welfare, health, and policing. We calculated per capita expenditures on social welfare (e.g., entitlements, social services), public health, and policing by using the 1992, 1997, 2002, and 2007 US Census of Governments.^{46–48}

Urban renewal. We used Collins and Shester’s urban renewal expenditure data to calculate the total dollars disbursed for urban renewal projects to cities in our MSAs in 1949

to 1974,⁴⁹ the period of active Title 1 urban renewal funding.⁵⁰ We divided expenditures by the 1950 population sizes of each MSA’s cities.⁵¹

Black uprisings. We used Olzak and Spilerman’s data to estimate the total number of large uprisings (i.e., protests concerning racial justice or racial conflict involving ≥ 50 people) that included Black participants in 1960 through 1969 (e-mail communication by Susan Olzak, Stanford University, August 9, 2007). The 1960s had substantially more uprisings than any other decade for which data were available (158 vs ≤ 38 in the 1950s, 1970s, 1980s, and 1990s) and these uprisings had major political, social, and economic consequences.^{30,52}

Analysis

We used descriptive statistics to characterize central tendencies and dispersions. Model building occurred in 3 stages.

Modeling change over time in the outcome. We normalized the outcome’s distribution by using a logit transformation.⁵³ Comparisons of Akaike information criteria (AIC) for nested models indicated that time (i.e., number of years since baseline) should be modeled cubically (i.e., time, time-squared, time-cubed).

Conducting bivariate models and domain analyses. We centered time-varying predictors (i.e., all but the 2 historical variables) at their baseline values to facilitate interpretation and transformed these centered predictors as needed to linearize their relationships with the outcome.⁵⁴ We next examined correlations between each predictor and the outcome by using 1-, 2-, and 3-year lags. Although none of the lagged correlations was stronger than the cross-sectional correlations, we selected the 1-year lag to facilitate causal inference.

To learn whether relationships between Black-specific measures and the outcome varied by White-specific measures, we next compared AICs for “bivariate” models that did and did not include these interactions. (All “bivariate” models included covariates for time.) In all but 2 cases (i.e., median household income, high-school dropout rates), models excluding interactions had the lowest AICs.

Next, we constructed bivariate hierarchical linear models (HLMs) to identify

TABLE 1—Prevalence of Injection Drug Use Among Black Individuals (Aged 15–64 Years) Over Time and Possible Structural Predictors of This Prevalence: 95 Large US Metropolitan Statistical Areas, 1992–2007

Variable	Median	25th Percentile	75th Percentile
Prevalence of IDU per 10 000 Black individuals (aged 15–64 y), 1993	280.72	178.38	401.56
Change between 1993 and 2007	-106.14	-174.47	-40.56
Socioeconomic domain			
Race/ethnicity			
% residents who were non-Hispanic Black, 1992	9.55	6.00	17.43
Change between 1992 and 2006	0.60	-0.15	1.76
% residents who were non-Hispanic White, 1992	77.39	64.48	84.31
Change between 1992 and 2006	-3.18	-5.71	-0.57
Schooling			
% Black adults (≥26 y) who did not have a high-school diploma or GED, 1992	23.01	19.06	24.83
Change between 1992 and 2006	-4.31	-6.07	-2.24
% White adults (≥26 y) who did not have a high-school diploma or GED, 1992	12.42	10.47	14.39
Change between 1992 and 2006	-1.44	-2.57	0.75
Employment			
% Black adults (≥16 y) who were employed, 1992	69.95	66.02	72.95
Change between 1992 and 2006	2.35	-3.13	5.64
% White adults (≥16 y) who were employed, 1992	80.80	79.05	83.21
Change between 1992 and 2006	0.67	-1.35	3.70
Poverty			
% households headed by Black adults below the federal poverty line, 1992	25.84	21.82	30.43
Change between 1992 and 2006	-1.74	-3.92	1.28
% households headed by White adults below the federal poverty line, 1992	7.38	6.10	9.09
Change between 1992 and 2006	1.43	0.52	2.16
Median income, US\$			
Households headed by Black adults, 1992	23 051.5	20 977.4	26 099.6
Change between 1992 and 2006	15 780.8	8 602.04	22 529.4
Households headed by White adults, 1992	32 619.2	31 034.5	46 391.4
Change between 1992 and 2006	20 137.7	13 871.7	25 144.2
Criminal justice activities domain			
Hard-drug^a arrest rate			
Black adults, per 10 000 Black adults 1992	85.14	42.81	139.03
Change between 1992 and 2006	-26.46	-56.76	12.69
White adults, per 10 000 White adults, aged 15–49 y, 1992	6.47	3.14	15.77
Change between 1992 and 2006	4.19	0.23	7.45
Jailed population rate			
Black adults, per 10 000 Black adults, 1993	93.92	49.16	129.78
Change between 1993 and 2005	19.00	-0.99	53.89
White adults, per 10 000 White adults, 1993	9.84	6.72	15.59
Change between 1993 and 2005	7.65	4.15	14.60

Continued

covariates that should be included in the preliminary domain analysis (discussed in the next paragraph). *P* values had little value here because the 95 MSAs were a census of all MSAs with populations of 500 000 or more in 1993. We therefore relied on the magnitudes of associations to select variables for the preliminary domain analysis. Specifically, we summed the absolute values of the 2 standardized betas generated in bivariate analyses for each “variable dyad” (e.g., baseline median income and change in median income since baseline); when this sum was greater than or equal to 0.20 we included the dyad in the preliminary domain analysis. We established a higher cutpoint (≥ 0.25) for the sets of median income and high-school dropout variables, as 6 standardized betas described their relationships to the outcome.

Domain analyses reduce multicollinearity in multivariable models.^{55–58} Here, we grouped covariates into our 3 conceptual domains (i.e., socioeconomic, criminal justice, expenditures), and we ran a separate preliminary HLM for each domain that included all variables in the domain meeting the standardized *B* cutpoints (i.e., ≥ 0.20 or ≥ 0.25). We entered variables that met the cutpoints in each domain-specific analysis into the final multivariable model. We excluded per capita urban renewal funding and the number of large uprisings from the domain analysis; they were included in multivariable models because of their conceptual importance. Correlations between these variables and other predictors were low ($r \leq 0.28$).

Conducting multivariable analysis. The final HLM included all variables selected during the final analysis of each domain, as well as urban renewal funding and large uprisings. We probed interactions by using Preacher and Curran’s simple slopes and zones of significance methods.^{59–61}

AIDS-related deaths might have reduced the number of Black injectors in many MSAs, and several predictors might be associated with these deaths.^{62–65} To isolate the effects of this mediating pathway, we reran our final model including an annual, MSA-specific measure of death rates among Black injectors diagnosed with AIDS. We drew the death rate’s numerator (number of deaths among Black injectors diagnosed with AIDS) from the NHSS; its denominator was the number of Black injectors in that MSA that year.

TABLE 1—Continued

Expenditures on social welfare and policing			
Expenditures on public welfare, US\$, per 1000 residents, 1992	54.44	13.68	157.59
Change between 1992 and 2006	30.90	0.32	86.64
Expenditures on public health, US\$, per 1000 residents, 1992	40.32	24.24	86.87
Change between 1992 and 2006	37.95	17.38	96.42
Expenditures on policing, US\$, per 1000 residents, 1992	117.08	89.54	143.99
Change between 1992 and 2006	113.16	87.24	149.76
Historical context and deaths among injectors diagnosed with AIDS			
Per capita disbursements on urban renewal (1949–1974), US\$	126.26	57.92	187.11
Number of large (> 50 participants) uprisings about racial conflicts (1960–1969)	2	1	3
Death rate among Black injectors diagnosed with AIDS, per 10 000 Black injectors, 1992	70.22	33.36	145.76
Change between 1992 and 2006	-21.83	-67.31	9.90

Note. GED = general equivalency diploma; IDU = injection drug use.
^a“Hard drugs” are opiates and cocaine and cocaine derivatives.

When interpreting findings from final models, we set a “substantive significance” cutpoint of standardized beta of 0.10 or greater for each variable. To facilitate

interpretation, we calculated odds ratios (ORs) by exponentiating standardized betas. Because the outcome variable was the logit of a population prevalence, these ORs capture

relationships of 1-SD changes in predictors to the odds that a Black individual injects. When ORs were less than 1, we divided 1 by the OR to facilitate in-text interpretations (though we retained the original OR value in tables).

RESULTS

In the socioeconomic domain, median rates of Black high-school dropout and poverty were approximately 25% in 1992; median change scores indicate modest improvements in these indicators over time (Table 1). In the criminal justice domain, median rates of arrest and jail-based incarceration for Black adults in 1992 were 85 per 10 000 and 94 per 10 000, respectively. Median change scores suggest that arrest rates declined substantially whereas incarceration rates increased. Whites fared better on all socioeconomic and criminal justice indicators in 1992. Within the expenditures domain, median expenditures on public welfare, health, and policing in 1993 were \$54, \$40, and \$117 per 1000 residents, respectively; expenditures increased for all indicators. Half of the MSAs spent \$126 or more per capita on urban renewal programs in 1949 through 1974. Half experienced 2 or more uprisings in 1960 through 1969.

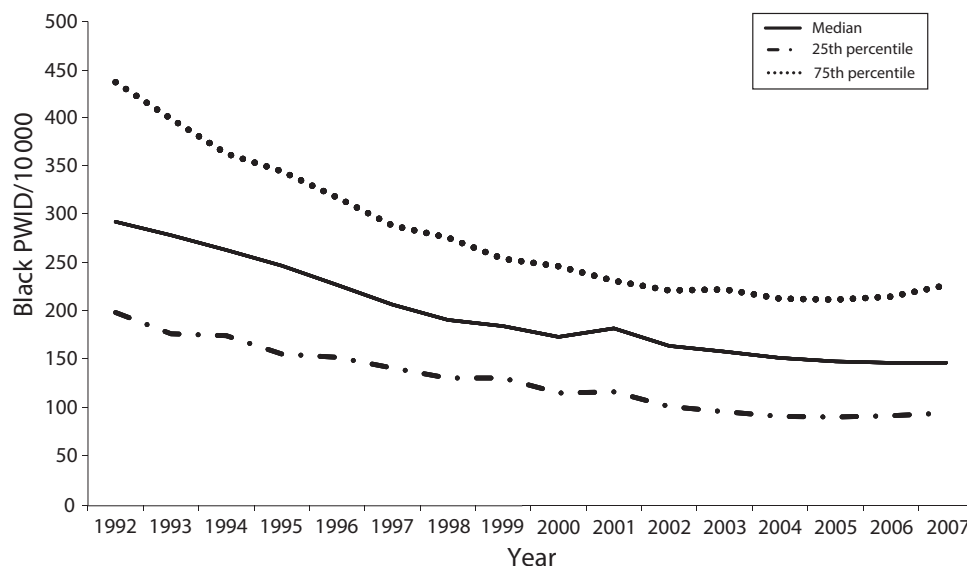


FIGURE 1—Median, 25th Percentile, and 75th Percentile for Black Persons Who Inject Drugs (PWID): 95 Large US Metropolitan Statistical Areas, 1992–2007

The median Black IDU prevalence was 281 per 10 000 in 1993 (25th and 75th percentiles: 178 per 10 000, 402 per 10 000; Figure 1). Black IDU prevalence dropped a median of 106 per 10 000 (25th and 75th percentiles: -175 per 10 000, -41 per 10 000) between 1993 and 2007. Model-based estimates of change over time indicate that Black IDU prevalence dropped steadily on average across MSAs between 1993 and 2004 and then rose gradually thereafter (beta for time = -0.06 [$P < .001$]; for time-squared = -0.002 [$P < .323$]; and for time-cubed = 0.0002 [$P < .01$]).

Bivariate and Domain Analysis Results

Within the socioeconomic domain, bivariate analyses indicated that the following variable sets met cutpoints for inclusion in the preliminary domain analysis: percentage of residents who were Black, and main effects and interaction terms for Black and White median income and for Black and White high-school dropout (Table 2). Results of the final domain analysis suggested that the multivariable model should include all 3 variable sets.

In the criminal justice domain, we included hard-drug arrests and incarceration for Black adults in the preliminary domain analysis. We included only incarceration rates in the multivariable model.

In the expenditures domain, we included expenditures on public welfare and health in the preliminary domain analysis. We included only public welfare expenditures in the multivariable model.

Multivariable Results

An inverse relationship existed between the percentage of residents who were Black and Black IDU prevalence. Specifically, the odds that a Black adult (for the sake of brevity, we use the term “adults” hereafter because the vast majority of people aged 15 to 64 years can be classified as adults) injected drugs in 1993 were 28% lower in MSAs where the (square root of the) percentage of residents who were Black was 1 SD higher than the mean across the 95 MSAs in 1992 (Table 3; model A).

Just 2 parameters describing the relationship between high-school dropout and the

TABLE 2—Results of Hierarchical Linear Bivariate and Domain Analyses for a Study of Predictors of the Prevalence of Injection Drug Use per 10 000 Black Individuals (Aged 15–64 Years) Over Time: 95 Large US Metropolitan Statistical Areas, 1993–2007

Predictor Variables	Bivariates, B (95% CI)	Domain Analysis, Final Model, B (95% CI)
% population who were Black		
1992, square root	-0.34 (-0.51, -0.17)	-0.40 (-0.59, -0.21)
Change since 1992	-0.04 (-0.06, -0.01)	-0.04 (-0.07, -0.02)
% adults (≥ 26 y) without a high-school diploma or GED		
1992 Black adults, squared	-0.24 (-0.46, -0.01)	-0.09 (-0.32, 0.14)
Change since 1992 for Black adults	0.12 (0.08, 0.15)	0.13 (0.10, 0.16)
1992 White adults	0.005 (-0.22, 0.23)	0.05 (-0.17, 0.28)
Change since 1992 for White adults, log	0.02 (-0.004, 0.04)	0.01 (-0.02, 0.03)
1992 White education * 1992 Black education	-0.09 (-0.29, 0.11)	-0.13 (-0.31, 0.05)
Change since 1992 in White education * change since 1992 in Black education	-0.02 (-0.04, -0.01)	-0.03 (-0.04, -0.01)
% Black adults (≥ 16 y) who were employed		
1992	-0.16 (-0.35, 0.02)	Eliminated
Change since 1992	0.008 (-0.04, 0.05)	Eliminated
Median households income		
1992 households headed by Black adults	0.08 (-0.14, 0.31)	-0.05 (-0.26, 0.17)
Change since 1992 households headed by Black adults	0.08 (0.04, 0.12)	0.10 (0.06, 0.14)
1992 households headed by White adults	0.09 (-0.13, 0.30)	0.25 (0.04, 0.47)
Change since 1992 for households headed by White adults	0.03 (-0.03, 0.08)	0.05 (0.00, 0.11)
1992 White median income * 1992 Black median income	-0.11 (-0.28, 0.06)	-0.14 (-0.30, 0.01)
Change since 1992 in White median income * change since 1992 in Black median income	-0.03 (-0.05, -0.01)	-0.04 (-0.07, -0.02)
% households in poverty		
1992 households headed by Black adults	-0.10 (-0.29, 0.08)	Eliminated
Change since 1992 for households headed by Black adults	-0.02 (-0.04, 0.01)	Eliminated
Hard-drug^a arrests per 10 000 Black adults		
1992, square root	0.18 (0.01, 0.36)	Eliminated
Change since 1992	0.02 (-0.004, 0.05)	
Jailed population rate per 10 000 Black adults		
1993, square root	0.24 (0.05, 0.42)	0.24 (0.05, 0.42)
Change since 1993	-0.03 (-0.06, -0.003)	-0.03 (-0.06, -0.003)
Expenditures on public welfare per capita		
1992	0.29 (0.11, 0.47)	0.29 (0.11, 0.47)
Change since 1992	-0.02 (-0.05, 0.01)	-0.02 (-0.05, 0.01)
Expenditures on health per capita		
1992	0.25 (0.07, 0.42)	Eliminated
Change since 1992	0.03 (-0.01, 0.06)	
Expenditures on police per capita		
1992	0.02 (-0.16, 0.21)	Eliminated
Change since 1992	0.07 (0.02, 0.12)	

Continued

outcome were substantively significant: both the baseline dropout rate for Whites and change since baseline in the dropout rate for Black adults were positively associated with

IDU prevalence. Specifically, the odds that a Black adult injected in 1993 were 10% higher in MSAs where the percentage of Whites who were high-school dropouts was

1 SD above the mean in 1992; these odds increased by 10% with every 1-SD increase in the percentage of Black adults who were high-school dropouts over time.

The relationship between median household income in households headed by Black adults and the outcome depended on the median household income in households headed by White adults. In the set of MSAs where White income was at the mean in 1992, there was no relationship between Black income in 1992 and the outcome. In MSAs where 1992 White income was high (i.e., 1 SD > mean), higher 1992 Black income was inversely associated with injecting. In MSAs where White income was low in 1992 (i.e., 1 SD < mean), lower 1992 Black income was protective. A similar pattern emerged for changes in income: declining Black income was associated with lower Black IDU prevalence in MSAs where White income stagnated or declined.

Incarceration rates were unrelated to the outcome.

The odds that a Black adult injected in 1993 were 7% higher in MSAs that invested 1 SD more than the mean in public welfare per capita in 1992.

The odds that a Black adult injected were 12% lower in MSAs with 1 SD more Black uprisings (logged) than the mean in 1960 through 1969. Urban renewal funding was unrelated to injecting.

Adding the measure of death rates among Black injectors with AIDS to the model did not substantively alter relationships between predictors and the outcome (i.e., differences in ORs for substantive predictors in models with and without this variable were less than 10%; Table 3; Model B).

Although the ORs are relatively modest, they refer to relationships between MSA-level exposures shifts in the distribution of IDU prevalence across entire populations, and thus carry significant importance for the public's health.

DISCUSSION

As reported previously,¹⁵ Black IDU prevalence declined substantially in 1993 through 2003 and rose slightly thereafter. Covariates within the socioeconomic and expenditures domains predicted this

TABLE 2—Continued

Number of large uprisings (1960–1969), logged	-0.10 (-0.31, 0.12)	NA
Per capita urban renewal funds disbursed (1949–1974), square root	-0.006 (-0.19, 0.18)	NA
Death rate among Black injectors, per 10 000 Black injectors diagnosed with AIDS		
1992	-0.15 (-0.34, 0.03)	NA
Change since 1992	-0.07 (-0.09, -0.05)	NA

Note. CI = confidence interval; GED = general equivalency diploma; NA = not applicable. All bivariate models and domain analyses control for linear, quadratic, and cubic expressions of time. The outcome was logit transformed to linearize its association with predictors.

^a“Hard drugs” are opiates and cocaine and cocaine derivatives.

outcome, as did Black uprisings. Our findings strengthen the hypothesis that contextual factors affect patterns of drug use, and that in particular contextual factors predict Black IDU prevalence.

Our finding that MSAs with higher percentages of Black residents had lower Black IDU prevalence may testify to the protective effects of collective power in Black communities. Internalized, interpersonal, and structural discrimination creates vulnerability to substance use and other mental health problems among Black adolescents and adults,^{24,66–70} though a positive racial identity can protect against discrimination's harmful effects.⁷¹ Consistent with LaVeist's finding that Black political power protects against Black neonatal mortality,⁷² Black communities in MSAs with high proportions of Black residents may have been able to develop strong networks of social resources and perhaps political institutions that buffer discrimination and support the creation of positive Black identities.

In an era of mass incarceration,^{73,74} it is difficult to interpret economic indicators for Black adults. Jurisdictions that incarcerate many Black residents may seem to be doing “better” economically simply because they have locked up (and thus excluded from economic surveys) many impoverished Black residents.⁷⁵ This limitation was likely compounded here by our use of linear interpolation methods to assess annual change in economic measures, which may change cyclically or precipitously. The relationships found here between median income, graduation rates, and Black IDU prevalence are complex and merit investigation with data in which individuals are nested in places.

We offer some preliminary interpretations. Our findings about the protective effects of

higher Black income in 1992 in MSAs where White income is high, and of increasing Black high-school graduation rates are broadly consistent with past research on economic conditions and drug use.^{1–5} Economic security may allow Black communities to create social and political resources that help individuals thrive and buffer shocks. Our findings testify specifically to the protective effects of living in an MSA where both absolute and relative (i.e., Black–White) economic deprivation is minimized. The finding that low or declining income among households headed by Black adults was protective in MSAs where White income was low, static, or declining may reflect the consequences of declining drug prices in areas where median income is declining.⁷⁶ Because injecting is a cheaper drug-delivery mode, increasing drug costs promote injection initiation among active users⁷⁷; declining drug prices may disincentivize injection initiation among active users.

The positive relationship between expenditures on public welfare in 1992 and Black IDU prevalence may reflect the combination of high need for services with restricted access to them. Metropolitan statistical areas with high levels of social suffering (e.g., homelessness) might have spent more on public welfare to meet local need; these same contexts also create vulnerability to drug use and IDU.^{1–5} Formal and informal governmental and organizational policies^{78–80} often exclude people using illegal drugs from these services. Denying drug users shelter, food, or other support fundamental to survival may facilitate injection initiation among drug users or reduce the likelihood of injection cessation.^{81–83}

At best, the lack of relationship between jail-based incarceration rates and Black IDU prevalence provides supports past studies

TABLE 3—Hierarchical Linear Regression of Select Metropolitan-Area Characteristics on the Prevalence of Injection Drug Use per 10 000 Black Individuals (Aged 15–64 Years): 95 Large US Metropolitan Statistical Areas, 1993–2007

Predictors	B (95% CI)		Odds Ratios ^a (95% CI)	
	Model A	Model B ^b	Model A	Model B
Time				
No. of years since 1993	–0.21 (–0.28, –0.15)	–0.20 (–0.27, –0.13)	0.87 (0.83, 0.91)	0.88 (0.84, 0.92)
No. of years since 1993, squared	0.007 (–0.003, 0.02)	0.003 (–0.008, 0.01)	1.00 (1.00, 1.01)	1.00 (1.00, 1.01)
No. of years since 1993, cubed	0.0002 (–0.0003, 0.0007)	0.0004 (–0.0001, 0.001)	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)
Socioeconomic domain				
% residents who are Black				
1992, square root	–0.37 (–0.61, –0.12)	–0.35 (–0.61, –0.08)	0.78 (0.66, 0.92)	0.79 (0.66, 0.95)
Change since 1992	–0.09 (–0.12, –0.06)	–0.10 (–0.13, –0.07)	0.94 (0.92, 0.96)	0.94 (0.92, 0.96)
% adults (≥26 y) who do not have a high-school diploma or GED				
1992 Black adults, squared	–0.04 (–0.34, 0.26)	–0.006 (–0.32, 0.31)	0.97 (0.79, 1.19)	1.00 (0.81, 1.23)
Change since 1992 for Black adults	0.15 (0.09, 0.20)	0.13 (0.08, 0.19)	1.10 (1.06, 1.14)	1.09 (1.06, 1.14)
1992 White adults	0.14 (–0.17, 0.46)	0.12 (–0.20, 0.44)	1.10 (0.89, 1.36)	1.08 (0.88, 1.35)
Change since 1992 for White adults, logged	–0.004 (–0.04, 0.03)	–0.01 (–0.05, 0.03)	1.00 (0.97, 1.02)	0.99 (0.97, 1.02)
1992 Black adults, squared * 1992 White adults	–0.0008 (–0.30, 0.30)	0.009 (–0.32, 0.33)	1.00 (0.82, 1.22)	1.01 (0.81, 1.25)
Change since 1992 for Black adults * change since 1992 for White adults, logged	–0.02 (–0.04, 0.001)	–0.03 (–0.05, –0.004)	0.99 (0.97, 1.00)	0.98 (0.97, 1.00)
Median household income				
1992 households headed by Black adults	–0.09 (–0.40, 0.001)	–0.07 (–0.41, 0.26)	0.94 (0.76, 1.17)	0.95 (0.76, 1.19)
Change since 1992 for households headed by Black adults	0.11 (0.05, 0.17)	0.10 (0.04, 0.17)	1.07 (1.03, 1.12)	1.07 (1.03, 1.12)
1992 households headed by White adults	0.45 (0.19, 0.71)	0.43 (0.17, 0.70)	1.35 (1.13, 1.61)	1.34 (1.12, 1.60)
Change since 1992 for households headed by White adults	0.21 (0.13, 0.29)	0.20 (0.12, 0.28)	1.15 (1.09, 1.21)	1.14 (1.08, 1.21)
1992 households headed by Black adults * 1992 households headed by White adults	0.16 (–0.13, 0.46)	0.16 (–0.15, 0.46)	1.12 (0.92, 1.36)	1.11 (0.91, 1.36)
Change since 1992 for households headed by Black adults * change since 1992 for households headed by White adults	–0.11 (–0.15, –0.07)	–0.11 (–0.14, –0.07)	0.93 (0.91, 0.95)	0.93 (0.91, 0.95)
Criminal justice activities domain				
Jail-based incarceration rate for Black adults, per 10 000 Black adults				
1993, square root	–0.07 (–0.31, 0.17)	–0.07 (–0.34, 0.20)	0.96 (0.81, 1.12)	0.96 (0.80, 1.14)
Change since 1993	–0.04 (–0.09, 0.003)	–0.03 (–0.08, 0.02)	0.97 (0.94, 1.00)	0.98 (0.95, 1.01)
Expenditures on social welfare and policing				
Per capita expenditures on public welfare				
1992	0.10 (–0.09, 0.28)	0.10 (–0.10, 0.29)	1.07 (0.95, 1.21)	1.07 (0.94, 1.22)
Change since 1992	–0.03 (–0.06, 0.01)	–0.03 (–0.06, 0.01)	0.98 (0.96, 1.01)	0.98 (0.96, 1.00)
Historical context and death among injectors diagnosed with AIDS				
No. of large uprisings (1960–1969), logged	–0.17 (0.38, 0.04)	–0.15 (–0.37, 0.06)	0.89 (0.78, 1.03)	0.90 (0.78, 1.04)
Per capita expenditures on urban renewal, 1949–1974, square root	–0.01 (–0.23, 0.21)	–0.006 (–0.23, 0.22)	0.99 (0.86, 1.15)	1.00 (0.86, 1.16)
Death rate among Black injectors, per 10 000 Black injectors diagnosed with AIDS				
1992	Eliminated	–0.06 (–0.31, 0.19)	Eliminated	0.96 (0.81, 1.13)
Change since 1992	Eliminated	–0.09 (–0.12, –0.06)	Eliminated	0.94 (0.92, 0.96)

Note. CI = confidence interval; GED = general equivalency diploma. The outcome was logit transformed to linearize its association to the predictors.

^aOdds ratios were calculated by using a model in which the outcome was not standardized to generate correct effect estimates.

^bModel B differs from model A because the former includes a measure of the death rate among Black injectors diagnosed with AIDS.

finding that criminal justice approaches to addressing drug use have little deterrent effect.^{25,28} At worst, it suggests that mass incarceration may increase injecting in Black communities. Presumably, mass incarceration reduces Black IDU prevalence by removing large numbers of injectors from the community; the absence of a strong inverse relationship between incarceration rates and the outcome suggests that new injectors may “replace” incarcerated injectors. Several pathways may connect high incarceration rates to vulnerability to injecting. For example, mass incarceration and related intensive policing strategies may be experienced as forms of structural discrimination^{84,85}; at an individual level, incarceration may disrupt injection cessation attempts.⁸⁶

To our knowledge this is the first study to examine the relationship of Black uprisings to health. We found that a history of Black uprisings was protective against injecting among Black adults. Several interpretations are possible. First, uprisings may be a proxy for a robust economic and social historical context for Black Americans. Contrary to the Kerner Commission Report,⁸⁷ this form of collective action tended to occur in cities where Black poverty and dilapidated housing stock were relatively low, where social resources in the Black community were relatively strong, and where residential segregation was declining.^{29,31} This historical context may have had enduring protective effects against IDU. Members of communities with more material resources experience fewer social stressors and less psychological distress, which in turn protect against substance misuse¹; declining segregation may reduce Black IDU prevalence by providing more economic opportunities²⁴; and social resources within Black communities can foster social control.⁸⁸ In addition, in some cities these collective actions may have garnered more investment in or collective self-development of social and economic resources for Black communities, and greater Black community solidarity^{30,52,89}; perhaps these resources had protective legacy. Future research should clarify pathways through which Black uprisings affect Black IDU prevalence, and whether and how uprisings, including White riots to maintain supremacy,^{90–92} affect public health more generally.

Urban renewal expenditures were unrelated to the outcome. Possibly, our measure (per-capita funding) was inadequate; a stronger measure might have captured the number or proportion of Black households that these projects displaced.

Limitations

The Political Ecology of Health highlights the significance of context at multiple scales.^{20–23} This MSA-level analysis, however, ignored individual-, organizational-, or network-level factors and factors operating at other geographic scales as mediators, moderators, or confounders of MSA-level relationships.

The databases used to estimate Black IDU prevalence may have introduced limitations. For example, the Treatment Episode Data Set and the HIV Counseling and Testing Database may have underestimated the proportions of injectors who were Black, given that predominately Black neighborhoods tend to be medically underserved,^{93,94} and that spatial access to services predicts use.^{95–99} AIDS diagnosis data from NHSS, however, should counterbalance this bias, because AIDS rates would likely be elevated in medically underserved areas. Research suggests that these prevalence estimates have acceptable validity.¹⁵

Conclusions

Results provide evidence that context influences IDU. Prevailing approaches to drug use in the United States—drug treatment and incarceration—frame drug use as produced by individual-level factors. Consistent with past research,^{25,28} however, we found that incarceration rates have no deterrent effect on Black IDU prevalence. Future research should identify pathways linking economic security and Black collective agency to Black IDU prevalence. This study also suggests that future structural interventions consider targeting these mediators and seek to increase economic security (in Black and White communities) and Black collective agency. **AJPH**

CONTRIBUTORS

H. L. F. Cooper conceptualized the research questions and analyses and took the lead on writing the article. B. West conceptualized and conducted analyses. C. Cleland advised on analyses and interpretations. B. West,

S. Linton, M. E. Wolfé, M. Zlotorzynska, B. Tempalski, H. I. Hall, and L. Williams created variables. All authors contributed to the writing of the article.

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HUMAN PARTICIPANT PROTECTION

This study was approved by institutional review boards at Emory University and the National Development and Research Institutes Inc.

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