The Growth of Neighborhood Disorder and Marijuana Use Among Urban Adolescents: A Case for Policy and Environmental Interventions*

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ABSTRACT. Objective: This study examines the growth of neighborhood disorder and subsequent marijuana use among urban adolescents transitioning into young adulthood. **Method:** Data are derived from a longitudinal sample of 434 predominately African American 12th graders followed-up at 2 years after high school. The data are rich in repeated measures documenting substance use and misuse and neighborhood characteristics. Growth mixture modeling was used to examine how neighborhood disorder trajectories, measured through the presence of abandoned buildings on the blocks where participants reside, influence subsequent drug use beginning in late adolescence and into young adulthood. **Results:** A four-class solution characterizing neighborhood growth was selected as the final model and included rapidly improving, slightly improving, always-good, and deteriorating neighborhoods. Young adults living in neighborhoods that had been deteriorating over time were 30% more likely to use marijuana 2 years after high school than adolescents living in always-good neighborhoods (odds ratio = 1.30, $p = .034$). There was no relationship between living in a neighborhood that was improving and marijuana use. **Conclusions:** This study identified a salient and malleable neighborhood characteristic, abandoned housing, which predicted elevated risk for young-adult marijuana use. This research supports environmental strategies that target abandoned buildings as a means to improve health and health behaviors for community residents, particularly young-adult substance use. (*J. Stud. Alcohol Drugs, 72,* 371–379, 2011)

IN PUBLIC HEALTH RESEARCH, there has been a surge of interest in assessing how the neighborhood context sets the stage for health and health behaviors. However, this work has been strongly focused on examining how the environment impacts physical activity (Brownson et al., 2004, 2009) and healthy eating (Lytle, 2009), with little attention to how it affects adolescent risk behaviors, including marijuana use.

Neighborhood-level factors represent important but understudied potential determinants of adolescent drug use, representing a crucial gap in knowledge that limits our ability to identify effective primary prevention strategies targeted at the neighborhood level. The neighborhood context is uniquely relevant for low-income urban youth, because they are persistently exposed to drug activity, disorder (e.g., social and physical incivilities), and violence in their neighborhoods, all of which may influence drug use as well as the health and social problems that occur subsequent to drug use (Galea et al., 2005a, 2005b; Perkins et al., 1992; Spooner, 2005). Therefore, this article examines how changes in neighborhood context affect marijuana use among late adolescents.

Theoretical frameworks

Three major theories will be used to develop the theoretical framework for the proposed investigation. The first includes the family of incivilities theses or disorder theories. When applied to urban settings, these hypotheses purport that physical disorder in urban neighborhoods can lead to serious crime and further disorder (Mair and Mair, 2003; Taylor, 1999). A specific example of a disorder theory includes the Wilson and Kelling's Broken Windows theory (Cohen et al., 2000; Kelling and Coles, 1996; Wilson and Kelling, 1982), which suggests that broken windows left unattended signal disregard for the neighborhood environment and promote further damage, more severe crime, and heightened fear of crime among community residents. Specifically, residents who are surrounded by disorderly conditions presume that local officials cannot or will not intervene, and people become more willing to violate social norms within the

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neighborhood. Rather than focusing solely on individuals, Wilson and Kelling (1982) focused on individuals, groups of residents, offenders outside of the neighborhood, and declining neighborhood safety. Their work clarified a multistep process of how increasing incivilities unravel over time, causing weakened resident control over neighborhood life and heightened local fear and crime. Disorder theories provide insight on the processes by which neighborhoods decay, which may lead to severe social and physical disorder, creating neighborhoods where the "laws of the streets" prevail over the will of the residents. Disorder theories also support the modification of malleable environmental features, such as broken windows or abandoned housing, as a means to stabilize the neighborhood environment before it becomes overly dilapidated and in need of more intensive intervention.

The second set of theories falls under the umbrella of Opportunity Theory (Felson and Clarke, 1998) and includes the routine activity approach (Cohen and Felson, 1979), crime pattern theory (Brantingham and Brantingham, 1993), and the rational choice perspective (Clarke, 1997). These theories suggest that (a) individuals encounter opportunities for crime in their daily activities and (b) there are physical and social factors in the environment that help to shape a person's motivation to commit crime. A telling example relates to abandoned buildings, which have been described as "magnets of crime" because they serve as havens for drug taking, including shooting galleries for injection drug use (Longshore, 1996). Accordingly, adolescents living in neighborhoods with abandoned buildings may encounter greater opportunities to purchase and use drugs (Spelman, 1993).

The final theory is Bandura's Social Cognitive Theory, which explains that there is a dynamic interaction among an individual's behaviors and actions, cognition, and social environment (Bandura, 1986; Barth et al., 1992; Neumark-Sztainer, 1999; Rudan, 2000). The observational learning construct of Social Cognitive Theory suggests that youth can learn about drugs and substance use by seeing substance use and drug selling in their immediate social environments.

Collectively, these models provide a context for studying the environment and understanding how potential environmental manipulation may alter individual-level drug use. Living in a neighborhood characterized by abandoned housing and subsequently high levels of drug activity may increase adolescents' likelihood of using marijuana through decreased social control (e.g., lack of residents on the block), limited environmental constraints for deviant behavior (Sayeed et al., 2005), and observational learning of drug use.

There is a growing body of work substantiating the association between neighborhood disorder and adolescent and young adult marijuana use (Burlew et al., 2009; Lambert et al., 2004; Reboussin et al., 2007; Theall et al., 2009; Wilson et al., 2005). Lambert et al. (2004) found that perceived neighborhood disorder (e.g., drug sales and violent crimes) in Grade 7 was associated with increased marijuana use in Grade 9 using a sample of African American youth in the city of Baltimore. A similar linkage was discovered between perceived neighborhood disorder and current marijuana use among middle-school students from three different states in the United States (Wilson et al., 2005). Using a sample of youth in Atlanta, Theall et al. (2009) found that young adults who reported high levels of fear of their neighborhoods were more likely to report more marijuana and other drug use.

To our knowledge, no studies have used an objective assessment of neighborhood disorder to assess whether it is associated with adolescent marijuana use; all have used self-reported perceptions. The current research provides an objective and contextual analysis that the presence of abandoned buildings is related to the use of marijuana among adolescents as they age into young adulthood. The research also increases our understanding of how the urban neighborhood context influences marijuana use over time and lays a foundation for future investigations to test the hypothesis that the development of marijuana use is influenced by environmental factors (Mair and Mair, 2003).

Abandoned buildings are an acceptable proxy for neighborhood disadvantage and physical disorder and have been found to be potent and salient risk factors for substance use in young adults (Tarter et al., 2009) and premature mortality (Cohen et al., 2003). We are interested in this particular feature of the built-and-social-neighborhood environment because it follows a clear theoretical framework linking neighborhood malaise to crime and incivility and targets a readily quantifiable and malleable feature of the built environment. This offers potential to provide an evidence base for future environmental interventions and expanded community-based interventions to prevent and reduce environmental support for drug use.

Method

Data sources

Youth data: Baltimore Prevention Project (BPP). In 1993, 678 children and their families were recruited into the second-generation BPP trial sample. Fifty-three percent of the sample was male, 86.8% were African American, and 13.2% were White. At entrance into first grade, the children ranged in age from 5.3 years to 7.7 years, with a mean age of 6.2 years (SD = 0.34). Nearly two thirds (62.3%) of the children received free or reduced-price lunch. Of the 678 children available for participation in the fall of first-grade assessments, written parental consent was obtained for 97% of the children. Three percent of the parents or guardians refused to allow their children to participate in the assessments or failed to respond to the consent request. Chi-square analyses and t tests did not reveal any statistically significant differences in sociodemographic characteristics (ethnicity, age, gender, and free-lunch status) between the group with

parental consent and the group without consent. Three first-grade classrooms in each of the elementary schools were randomly assigned one of two intervention conditions or a control condition (Furr-Holden et al., 2004).

Five to 9 years after randomization, when the children were in the 6th through 10th grades, 566 of the children (approximately 83.5% of the sample) were assessed. Attrition in this population was unrelated to intervention status, and participants who were lost to follow-up did not differ from participants continuing in the study with respect to baseline teacher ratings, academic achievement, ethnicity, gender, or free-lunch status. Of the 566 participants followed through 2 years after high school, 434 resided in Baltimore City and are the targets for the present investigation.

Neighborhood data: The Neighborhood Inventory for Environmental Typology (NIfETy) instrument. The NIfETy method is a valid and reliable observational assessment method to assess neighborhood environmental characteristics related to violence, alcohol, and other drug (VAOD) exposure. It includes a standardized instrument (NIfETy instrument), training protocol, and quality measures (Furr-Holden et al., 2008, 2010). The NIfETy instrument is operationalized in seven domains: (a) physical layout of the block, (b) types of structures, (c) adult activity, (d) youth activity, (e) physical disorder and order, (f) social disorder and order, and (g) VAOD indicators. The NIfETy instrument includes quantitative and qualitative items operationalized on handheld electronic devices. A team of paired raters travel to the specified block faces and manually input data on a variety of items that fall within the seven NIfETy domains. Metric properties (i.e., the validity and reliability) of the NIfETy instrument are sound. Intraclass correlation coefficients (ICC) were used to estimate interrater reliability of the NIfETy instrument. The NIfETy has high reliability for the total scale (ICC = .84), the VAOD subscale (ICC = .71), and across raters (ICC = .67–.79). Validity metrics are also good. NIfETy indicators of VAOD exposure correlated strongly with BPP self-reported VAOD exposure and also with local crime data in prior study (Furr-Holden et al., 2010).

In larger, systematic studies of the environment, the NIfETy is conducted on a stratified random sample of unit "block faces" within neighborhoods. Block faces are defined as the unit block (e.g., 600–699 block of North Broadway) and include both the even and odd sides of the street and the spaces in between (e.g., the roadway, curb, and sidewalks). In the current research, NIfETy assessments were conducted on the residential block face where adolescents and young adults lived at the time of their BPP assessments during summer 2005, spring 2006, summer 2006, and spring 2007. These data correspond to BPP 12th-grade, 1-year post–high school, and 2-year post–high school assessments. Data collection for the BPP and the NIfETy study was approved by the institutional review board at The Johns Hopkins Bloomberg School of Public Health.

Measures

Neighborhood characteristics. The presence of abandoned buildings was the measure of neighborhood disorder used in this study. Abandoned structures are defined as unoccupied buildings located on the residential block face that appears to be uninhabitable and unmaintained. Although this one variable may not be entirely representative of neighborhood environment, we theorized that abandoned buildings would be an ideal measure because (a) abandoned buildings are often "magnets for crime" and ideal sites for adolescents and young adults to obtain or use drugs (Spelman, 1993), (b) this measure has been used in other studies to represent hazardous neighborhood environments (Cohen et al., 2003), and (c) it is a malleable neighborhood characteristic that can be targeted in future environmental interventions. The presence of abandoned buildings will herein be referred to as neighborhood disorder.

NIfETy data on abandoned buildings were collected during summer 2005, spring 2006, summer 2006, and spring 2007. Because 36 blocks were added to the BPP sample at the third time point (summer 2006), 8.3% (36 blocks) of the BPP sample had missing values on the first two time points (summer 2005 and spring 2006). Approximately 1% (four blocks) of the sample was missing neighborhood assessments at the fourth time point. When the respondents moved within the city limit, their new block was assessed using the NIfETy instrument. Since this investigation only included the blocks within the city limits, the respondents who moved out of Baltimore City had missing values at subsequent assessments. Thirty-eight respondents moved within the city limit between the second and the third time points. There was no change in the number of the respondents between the first and second waves, as well as between the third and fourth waves, because the BPP data were collected annually, whereas NIfETy data were collected biannually using the address from the BPP annual assessment. After accounting for missing data, the blocks with abandoned buildings at each time point were 18.4%, 23.3%, 17.7%, and 25.6% of samples, respectively.

Marijuana use. The BPP sample respondents have annual reports on marijuana use in the past year. Marijuana use 2 years after high school (in 2007) was the distal outcome of interest; 14.7% of BPP respondents reported past-year marijuana use at 2 years after high school (18.0% were missing marijuana use data). Marijuana use during the 12th-grade assessment (2005) was included as a covariate to control for persistent drug users. Marijuana use data at 12th grade were collected before, but proximal to, the first NIfETy assessment. More than one fifth (22.1%) of respondents at 12th grade reported past-year marijuana use (18.4% were missing marijuana use data).

Control variables. Demographic data—including information on gender, race, and receipt of free- or reduced-price

Table 1. Neighborhood, marijuana use, and demographic characteristics

Variables	%	% of missing data
Presence of abandoned buildings, Summer 2005	18.4	8.3
Presence of abandoned buildings, Spring 2006	23.3	8.3
Presence of abandoned buildings, Summer 2006	17.7	0.0
Presence of abandoned buildings, Spring 2007	25.6	0.9
Marijuana use at 12th grade	22.1	18.4
Marijuana use 2 years after high school	14.7	18.0
Demographics		
Male	52.8	0.0
African American	94.0	0.0
Free- and reduced-price lunch	27.2	30.9

meals—were included as control variables. More than one half (52.8%) of the sample was male, and 94% was African American (6% were White). Receiving subsidized lunches at 12th grade was selected as a proxy for family income because requirements for the program include family income at or below 100% of the federal poverty level. More than one quarter (27.2%) of respondents received subsidized lunch during 12th grade (30.9% missing data).

Missing data

Missing data ranged from 0% to 30.9%, as presented in Table 1. Instead of excluding cases with missing values, we used multiple imputation methods to include all observations and minimize incorrect inference and maximize power of analysis (Rubin, 1987). Multiple imputation methods can produce consistent and efficient estimates when data are missing at random (Allison, 2002). To maximize the efficiency of the estimates, 20 data sets were created using the imputation by chained equations (ice) method in STATA Version 10 (StataCorp LP, College Station, TX). Twenty imputations obtain 99% efficiency, even when the missing data proportion is 30% (Rubin, 1987). The 20 imputed data sets were analyzed in Mplus Version 5.21, producing averaged parameter estimates and standard errors over the 20 data sets (Muthén and Muthén, 1998–2010; Rubin, 1987).

Data analyses

Growth mixture modeling (GMM). GMM (Muthén and Shedden, 1999) was used to examine whether different trajectories of neighborhood disorder could explain the difference in the development of marijuana use through high school and into young adulthood. As with traditional growth modeling, GMM identifies a growth pattern with latent variables via intercept and slope(s). GMM is an extension of finite mixture modeling (McLachlan and Peel, 2000); however, GMM assumes that there can be two or more distinct temporal patterns of change (Muthén and Asparouhov, 2008). The finite number of latent classes captures the heterogeneity of qualitatively different trajectories. Allowing within-class variability, GMM treats the intercept and slope variables as random effects, as opposed to the latent class growth analysis (Muthén and Muthén, 2000; Nagin, 1999).

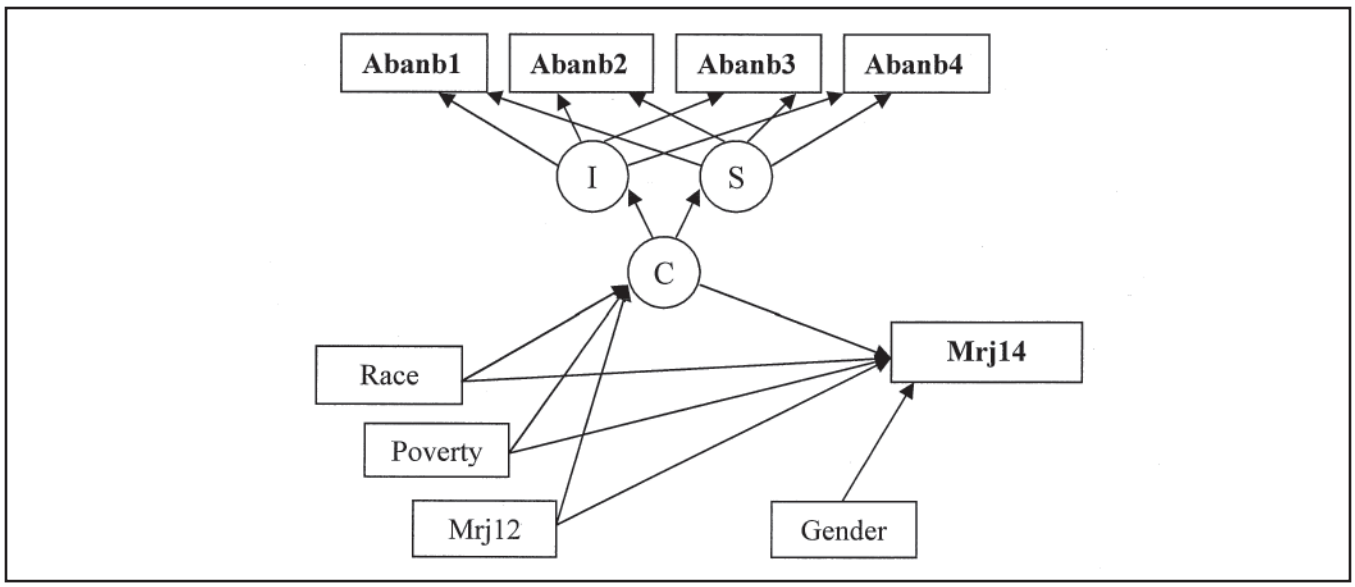

Figure 1. Growth mixture model diagram. This figure displays the covariates used to determine class membership. Neighborhood class (C) was a function of race, poverty (measured by free-/reduced-lunch status), and marijuana use at 12th grade (Mrj12). Abanb1–Abanb4 = presence or absence of abandoned buildings, Time Points 1–4; I = intercept; S = slope; C = neighborhood class; Mrj14 = marijuana use 2 years after high school.

Model selection strategy

Bayesian information criterion (BIC), sample-size adjusted BIC, entropy, Lo–Mendell–Rubin (LMR), and bootstrap likelihood ratio test (BLRT) were used to find the optimal number of neighborhood trajectories (classes). Although we took all fit statistics into account, special attention was given to the results of BLRT because it appeared to be the most reliable tool. Based on their simulation study, Nylund et al. (2007) demonstrated that BLRT performed best in deciding the number of classes.

GMM model specification. As Figure 1 summarizes, we assumed that the membership of the neighborhood class (labeled as C in Figure 1) was a function of race, subsidized-lunch status, and marijuana use at 12th grade (labeled as Mrj12 in Figure 1). However, we did not estimate the impact of gender on class because the gender of one respondent from a block would not represent the gender characteristic of the block. In other words, even if one respondent happened to be female, that would not necessarily mean that her block was female dominant. Conversely, when one respondent from a block was African American, it was logical to assume that the block would have a high probability of African American residents because people tend to live closely with others who are of the same race. Subsidized-lunch status and marijuana use at 12th grade were treated similarly to race because poverty and marijuana use also tend to cluster geographically.

We estimated the direct effects of race, lunch status, marijuana use at 12th grade, and gender on marijuana use at 2 years after high school (labeled as Mrj14 in Figure 1). Estimating the direct effects, we expected to find the actual influence of neighborhood characteristic on marijuana use of young adults. Our final model will present the influence of neighborhood trajectories on drug use of young adults, controlling for race, gender, lunch status, and previous drug use.

The distal outcome (i.e., marijuana use at 2 years after high school) was included in the model rather than running the regression on distal outcome separately from the growth mixture model. The latter was not available when running the model with multiple imputed data sets in the Mplus program. Including the distal outcome in the model is recommended by Muthén (2004) and allows the distal outcome to influence the parameter estimates of the latent classes (although significant alterations in class membership would be a cause for concern). In our case, the inclusion of the distal outcome in the model did not significantly alter the estimates of class membership from the results attained before, including the distal outcome.

Results

Several model fit indices were used to determine the optimal number of classes. Although both one-class and three-class models had partial supports for being the best model, in the end, the four-class model had the most combined supports for being the best. The one-class model, for example, had the support of the lowest BIC value, but its high sample-size adjusted BIC, as well as the clearly distinguishable latent class trajectories beyond one class, pointed otherwise. The three-class model was supported by both sample-adjusted BIC, as well as its discriminating trajectory types; however, the model was highly unstable when including the distal outcome in the model (i.e., the estimates of class membership changed dramatically when including the distal outcome). On the other hand, the four-class model had the support of LMR p values ($p = .004$) and BLRT p values ($p < .001$), as well as the stable estimates when including the distal outcome. Furthermore, the four-class model showed the highest entropy at .87. These results are summarized in Table 2.

The estimated probability graph in Figure 2 shows that there are four qualitatively different trajectories. In Figure 2, the significantly decreasing trajectory indicates "radically improving" neighborhoods (3%, 15 blocks) because the probability of abandoned buildings was dramatically reduced from spring 2006 to summer 2006. The "slightly improving" (4%, 18 blocks) and "always-good" (63%, 272 blocks) neighborhoods overlap at spring 2006, but their difference

Table 2. Model fit statistics of class solution

Model	No. of parameters	Log-likelihood	BIC	Adjusted BIC	LMR p	Entropy	BLRT p
One class	10	-834.99	1,730.71	1,698.97	–	–	–
Two class	17	-819.46	1,742.17	1,688.22	<.001	.78	<.001
Three class	24	-803.96	1,753.67	1,677.50	<.001	.85	<.001
Four class	31	-798.82	1,785.90	1,687.52	.004	.87	<.001
Five class	38	-792.80	1,816.37	1,695.78	.050	.81	.862
Six class	45	-787.21	1,847.71	1,704.91	.433	.75	.610

Notes: The model fit statistics included all covariates and distal outcomes. The unconditional models were not used for determining the number of classes, because class memberships changed when adding covariates to the model. BIC = Bayesian information criterion; LMR = Lo–Mendell–Rubin; BLRT = bootstrap likelihood ratio test.

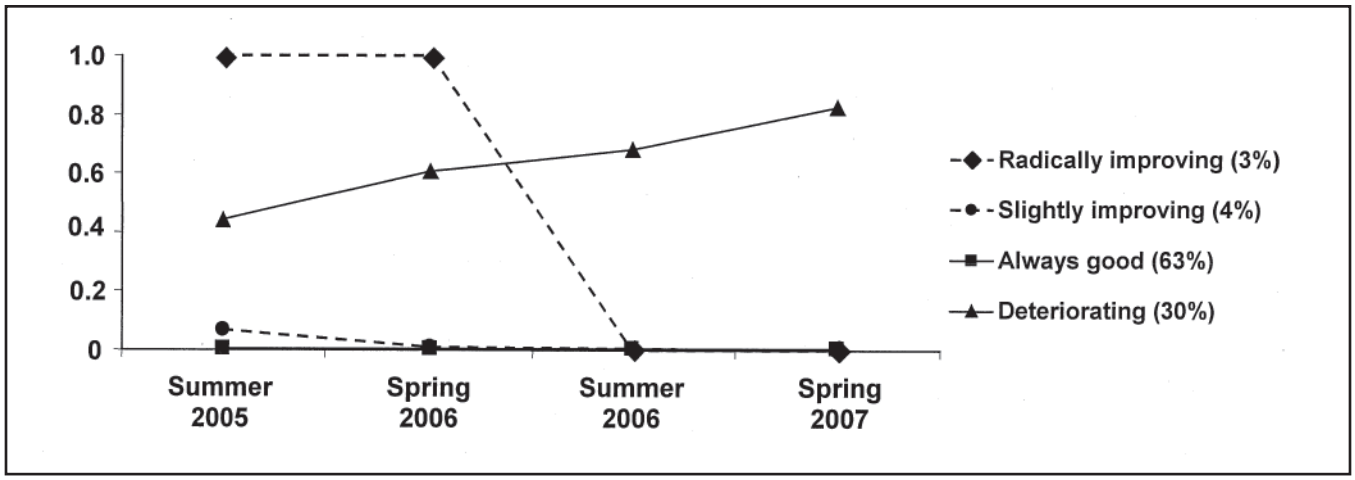

FIGURE 2. Estimated probability trajectories of the four-class model as a function of race, gender, and marijuana use at 12th grade and 2 years after high school. This figure illustrates the estimated probability trajectories as a function of race, gender, and marijuana use at 12th grade and 2 years after high school. The four neighborhood trajectories are radically improving, slightly improving, always good, and deteriorating.

at summer 2005 reflects the difference of initial status of abandoned buildings in blocks. The increasing trajectory indicates "deteriorating" neighborhoods (30%, 129 blocks).

Table 3 presents the multinomial logistic regression results between covariates (i.e., race, lunch status, and marijuana use at 12th grade) and neighborhood class membership for our four-class model, including covariates and a distal outcome. Respondents who were enrolled in the free- and reduced-meals program at school were 70% less likely to live in an always-good block than a deteriorating block, compared with students not receiving subsidized meals (odds ratio [OR] = 0.30, $p < .001$). Marijuana users at 12th grade were 90% less likely to live in slightly improving blocks than deteriorating blocks (OR = 0.09, $p = .064$).

Table 4 summarizes the relationship between neighborhood trajectories and marijuana use 2 years after high school, controlling for all covariates (i.e., race, free-/reduced-lunch status, marijuana use at 12th grade, and gender). Because no respondents from radically improving neighborhood used marijuana 2 years after high school, only three models were meaningful. Results indicated that respondents in a deteriorating neighborhood were 1.3 times more likely to use marijuana at 2 years after high school than those in an always-good neighborhood (OR = 1.30, $p = .034$). The relationship between neighborhood trajectory and marijuana use did not reach statistical significance when comparing slightly improving with always-good blocks (OR = 1.50, $p = .408$) and slightly improving with deteriorating blocks (OR = 1.15, $p = .376$), holding all other factors constant.

Discussion

This investigation revealed a statistically significant longitudinal association between changes in neighborhood disorder (i.e., abandoned buildings) and subsequent marijuana use. Emerging adults living in deteriorating neighborhoods (i.e., those neighborhoods with an increasing presence of abandoned structures over time) were more likely to use

TABLE 3. Latent class multinomial logistic regression results for four-class model with covariates and a distal outcome

Covariates	Target class	Reference class	Est.[a]	*SE*	*p*
Race	Radically improving	Deteriorating	1.69	1.58	.284
(0 = Black,	Slightly improving	Deteriorating	**6.74**	2.18	**.002**
1 = White)	Always good	Deteriorating	-11.31	7.18	.115
Lunch status	Radically improving	Deteriorating	0.19	0.63	.761
(0 = paid,	Slightly improving	Deteriorating	-1.64	1.47	.265
1 = free or reduced)	Always good	Deteriorating	**-1.20**	0.26	**<.001**
Marijuana use	Radically improving	Deteriorating	**-25.60**	0.83	**<.001**
at 12th grade	Slightly improving	Deteriorating	-2.40	1.30	.064
(0 = nonuser,	Always Always-good	Deteriorating	-0.17	0.28	.550
1 = user)					

Notes: **Bold** indicates statistical significance. Est. = estimate. [a]The impact of covariates on log odds of membership in target class versus membership in reference class.

TABLE 4. Class-specific model-estimated probabilities of marijuana use at 2 years after high school

Target class[a]	Reference class	Prob.[b]	*SE*	Est. OR[c]	*SE*	*p*
Slightly improving	Always good	.10	.10	1.50	1.81	.408
Deteriorating	Always good	.09	.03	**1.30**	0.61	**.034**
Slightly improving	Deteriorating	.10	.10	1.15	1.30	.376

Notes: **Bold** indicates statistical significance. Prob. = probability; est. OR = estimate of odds ratio. [a]Radically improving neighborhoods removed: no marijuana users in target class; [b]probability (marijuana use at 2 years after high school | membership in target class); [c]odds (marijuana use at 2 years after high school | membership in target class): odds (marijuana use at 2 years after high school | membership in reference class).

marijuana, compared with emerging adults living in neighborhoods that consistently had fewer abandoned buildings. Other neighborhood trajectories, namely radically improving and slightly improving, did not predict marijuana use in the sample. These findings are consistent with cross-sectional studies that demonstrate a relationship between neighborhood disadvantage and adolescent drug use and exposure (Crum et al., 1996; Fite et al., 2009; Winstanley et al., 2008). Crum et al. (1996) found that adolescents living in the most disadvantaged neighborhoods were more likely to have been offered cocaine than adolescents living in more advantaged communities (OR = 5.6, $p = .001$).

This study is important because it extends existing research in three ways. First, we used an objective neighborhood measure temporally linked to reported drug use. Although cross-sectional studies have examined the association between neighborhood characteristics and substance use, few studies successfully supported that neighborhood environment can predict drug use behaviors. The finding of temporality in this study will improve the predictive power of environmental studies to substance use. Second, both the behavioral measure and the neighborhood measure are longitudinal. Finally, GMM analyses allowed identification of discrete neighborhood trajectories that could be used to predict young-adult marijuana use, while simultaneously controlling for prior marijuana use. Few studies have used growth modeling to examine predictors of adolescent and young-adult marijuana use, and the majority of studies that have were focused on family environment, family history of marijuana use, and peer marijuana use (Curran et al., 1997; Duncan et al., 1997, 1998, 2000; Wills and Cleary, 1999). This study suggests that more work should focus on the neighborhood environment to better explain drug use behaviors of adolescents and young adults.

The limitations of this work merit discussion. First, causality cannot be fully assumed from this investigation. Temporality is addressed by using multiple measures of neighborhood environment before the outcome of interest, and the criterion of plausibility is met because of the theoretical basis of this work. Additionally, the findings are coherent with other research, as discussed above. However, other criteria (dose response, experimental evidence) are not addressed in this investigation. The second limitation of our approach is the use of a single measure to classify neighborhood environment (i.e., presence of abandoned structures). Although we have several reasons for using this measure (e.g., magnets for crime and a malleable and easily identifiable characteristic), it may not be sufficient to fully characterize the neighborhood environment.

Despite these limitations, this work is derived from a unique and model approach to longitudinal environmental assessment: the NIfETy. To our knowledge, no other quantitative method of this nature exists that has been demonstrated as valid and reliable. The NIfETy approach offers a potential next step in this line of research to include a broader range of neighborhood characteristics. Metric analysis of the NIfETy does show underlying subscales that characterize high-drug and high-disorder environments. Empirically, a broader definition of neighborhood disorder is an important next step in this research. To that end, future research will include longitudinal assessments of a broader range of environmental indicators that may further explain variations in drug use and a broader range of health outcomes.

From a policy perspective, the current research makes a compelling case for feasible environmental interventions aimed at reducing drug use, namely to address vacant and abandoned housing. On November 3, 2010, the mayor of Baltimore City released a six-part proposal, called Vacants to Value, to reduce the number of abandoned houses in Baltimore City. These new policies will make it easier for residents to purchase, renovate, and inhabit previously abandoned housing. This is an extension of a separate effort that began in 2000 termed Project 5,000, wherein the goal was for Baltimore City to acquire 5,000 vacant properties through tax sale and traditional acquisitions. Project 5,000 made great strides, in that nearly 5,000 vacant homes were acquired by Baltimore City, and the titles were cleared for sale. This current program, Vacants to Value, fills many gaps left by Project 5,000 and proposes a databank of all vacant homes so that municipal officials can readily identify the locations of vacant properties and also see environmental shifts in residential occupancy and intervene accordingly. The program also includes streamlining the sale of vacant city property; strengthening code enforcement efforts in tran-

sitional blocks and emerging markets to promote rehabilitation; and providing new, targeted incentives for homebuyers and developers who invest in vacant homes. The package of incentives includes a new $5,000 forgivable loan program for city police, firefighters, and teachers who purchase or rehabilitate vacant homes. This can serve potentially as a model program for local governments to employ to reduce vacant housing and improve residential stability.

Future directions in this line of research will explore if changes in abandoned housing are related to changes in drug use. This work will allow us to partner with local municipal officials and stakeholders to implement environmental strategies and evaluate the impact of those efforts. We plan to monitor changes in the neighborhood environment as the mayor's plan to reduce vacant houses is implemented. This research could be used as a model approach for other urban locales to inform researchers and local stakeholders of the added health benefits of improving residential occupancy in disordered communities.

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