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AN OBSERVATIONAL CROSS-SECTIONAL STUDY OF ALCOHOL OUTLETS AND ASSOCIATED ALCOHOL AND COCAINE/CRACK USE AMONG AFRICAN AMERICAN ADULTS IN ATLANTA, GEORGIA

By

Colleen M. Haynes

Master of Public Health

Epidemiology

_____

Dr. Anne Spaulding

Faculty Thesis Advisor

_____

Dr. Kirk Elifson

Thesis Field Advisor

_____

Dr. Eric Nehl

Thesis Field Advisor

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Abstract

AN OBSERVATIONAL CROSS-SECTIONAL STUDY OF ALCOHOL OUTLETS AND ASSOCIATED ALCOHOL AND COCAINE/CRACK USE AMONG AFRICAN AMERICAN ADULTS IN ATLANTA, GEORGIA

By Colleen M. Haynes

Cocaine/crack use has been widely recognized as a public health concern that has negative social and health consequences. On average, African Americans in inner-city neighborhoods have higher rates of cocaine/crack use, with which concurrent alcohol use is commonly reported. This group also experiences high alcohol outlet density, which is associated with increased alcohol consumption. The authors used cross-sectional data from the *People and Places* study to examine concurrent alcohol and cocaine/crack use with the number of alcohol outlets within one mile of African American adult residences in disadvantaged neighborhoods of Atlanta, Georgia. Logistic regression models were used to estimate the association between alcohol outlet density and 30-day concurrent cocaine/crack and alcohol use, exclusive cocaine/crack only use, exclusive alcohol use, and use of neither, while controlling for socio-demographic factors and perception of neighborhood drug/alcohol problems. Off-site alcohol outlets such as liquor stores were statistically significantly associated with 9% higher odds of 30-day exclusive use of cocaine/crack (95% CI: 1.03, 1.15) and 2% higher odds of concurrent cocaine/crack and alcohol use (95% CI: 1.00, 1.04). Conversely, on-site alcohol outlets such as bars had an inverse association with both exclusive cocaine/crack use (OR: 0.97, 95% CI: 0.95, 0.99) and concurrent cocaine/crack and alcohol use (OR: 0.99, 95% CI: 0.98, 0.997). There was no apparent association between off-site or on-site alcohol outlet density and exclusive alcohol use. Increased negative perception of neighborhood drug and alcohol problems was associated with 18% higher reported use of concurrent cocaine/crack and alcohol use ($p<0.0001$). This study supports the possible association between off-site alcohol outlet density and cocaine/crack use, both exclusively and concurrently with alcohol among African American adults in disadvantaged neighborhoods of Atlanta, Georgia.

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TABLE OF CONTENTS

CHAPTER ONE

LITERATURE REVIEW

Introduction

Over the past two decades, crack cocaine use has dwindled in the United States, yet still burdens disadvantaged urban neighborhoods. A wide variety of studies have produced results associating disadvantaged neighborhoods with alcohol and drug use, particularly crack cocaine. In this time, alcohol outlets have emerged as a hallmark feature in disadvantaged neighborhoods, and their presence has not gone unnoticed. Literature has established an association between alcohol outlets and neighborhood characteristics such as poverty, substance use, and violence. The presence of alcohol outlets in disadvantaged neighborhoods is markedly high for African Americans, a minority group that has also been disproportionately impacted by cocaine/crack abuse.

With co-morbidity of alcoholism being common among persons addicted to cocaine/crack, investigating an association between alcohol outlets and cocaine/crack use may increase understanding of the relationship between neighborhood characteristics such as alcohol availability and neighborhood levels of crack cocaine use. The current study aims to examine the presence of alcohol outlets in census block groups of inner-city Atlanta and concurrent alcohol and crack cocaine use among residential African American adults. This literature review will discuss previous research relevant to this potential association, first addressing the burden of cocaine/crack, the relationship between alcohol and cocaine/crack use, how neighborhood disadvantage and social capital may foster substance use, the presence of alcohol outlets and negative

health/social outcomes, and an ecological approach to the relationship between neighborhood alcohol outlet density and crack cocaine and alcohol use.

Cocaine/crack

Cocaine use has been widely recognized as a public health concern for over two decades and remains an illicit drug associated with an array of health, social, and criminal problems (1). For instance, in 2011, cocaine was the most frequently cited illicit drug involved in emergency department visits (2). Cocaine was also the most commonly reported illicit drug for arrests in 2009, with 75% of the arrests being African American (3). National surveillance statistics such as these generally combine crack cocaine and powder cocaine into one illicit drug group, but crack cocaine, a smokable or 'free base' form of traditional powder cocaine, represents a large portion of overall cocaine use in the United States, and has shown no appreciable decline among active users in recent years (4, 5).

With the peak of crack cocaine use taking place in the early 1980s, those born before 1970 have been labeled the 'Crack Generation' (1, 6). Using data from the Arrestee Drug Abuse Monitoring (ADAM) program, Golub and colleagues estimated that crack cocaine use plateaued in Atlanta, Georgia in the late 1990s and began a general decline before 2000 due to lower rates of initiation of use among young arrestees (7). Parallel to this finding, results from the 2011 National Survey on Drug Use and Health reported only 0.5% of people 12 or older are current cocaine users (2). Although this overall decline of use among adolescents is encouraging, data from a 2009 national survey of American adolescents found that 65% of 8th-grade students reporting any cocaine use also had some experience with crack cocaine (5). Still, the highest rates of

cocaine/crack use are among older age groups. According to national data from 2000-2010, the detected use of cocaine/crack was above 60% among Atlanta arrestees born in 1960-64 (7). More recently, this age group also made up the bulk of cocaine-related emergency department visits in 2011 (2). These findings suggest that although cocaine/crack initiation has decreased among adolescents, high-risk use is still a concern among older populations and is evident from recent arrestee and emergency department data.

In addition to older populations being at higher risk for cocaine/crack use, research has found African Americans in the United States to be disproportionately impacted by cocaine/crack use. In 2011, overall illicit drug use among African Americans was found to be higher than Hispanics, Whites, and Asians (2). This higher prevalence of illicit drug use is may also be high-risk or dependent use, as the prevalence of drug dependence was observed to be higher among African Americans in the 2001-2002 National Epidemiologic Survey on Alcohol and Related conditions (8). These results found a graded increase of drug dependence across male age groups age 18-29 to age 45-64, showing the strongest trend among African Americans (8). Implications of this literature further support the notion that current rates of cocaine/crack use can be expected to be most severe among older black/African Americans in the current study.

Higher rates of cocaine/crack use among older generations of African Americans can be traced back to the introduction and spread of crack cocaine in the United States. When first introduced, crack cocaine spread quickly into inner cities, particularly within black communities (5, 9, 10). This initial spread of crack cocaine into urban African American communities was still evident years later. In a 1997 longitudinal study,

Ensminger and colleagues observed rates of cocaine/crack use among African Americans in inner city neighborhoods that were two to five times higher than that of the general population (11). Although research has established that African Americans are at higher risk for cocaine/crack use, there is also research identifying caveats to this relationship of drug use among African Americans. For example, in a community sample of crack smokers followed for approximately 8 years, the proportion of African Americans participants meeting criteria for cocaine dependence was much lower than white participants in the study (12). Additionally, Lillie-Blanton and colleagues published research in 1993 suggesting that an individual's social and environmental risks are more influential on potential crack use than that of their racial/ethnic group (13). This finding encourages further investigation of environmental or neighborhood factors that influence cocaine/crack use among African Americans.

Cocaine/crack use is critical to address as a public health concern due to its range of negative physical, psychological, and social effects. The health risks associated with crack cocaine are vast, including cardiovascular, neurologic, psychiatric, pulmonary, gastrointestinal, musculoskeletal and dermatologic problems (6, 14-16). Use has also been associated with high risk sexual behaviors such as lower rates of condom use, having more sex partners, and engaging in unprotected sex in exchange for money or drugs (17-21). As an associated concern of engaging in these high risk behaviors, crack cocaine users are also at higher risk for contracting sexually transmitted infections, including HIV/AIDS (22-24). These health behaviors associated with crack cocaine use are disproportionately high among African American women in disadvantaged, inner-city

neighborhoods and have also caused late-onset crack cocaine users to emerge as a group that is at high risk for HIV infection (25, 26).

In addition to health consequences, social problems commonly accompany the use of crack cocaine, as users typically have more family problems than other substance users and are more likely to engage in violent behaviors, such as aggression and firearm possession (18, 27, 28). A 1990 cross-sectional study sampling crack cocaine-dependent patients from a rehabilitation facility found that 61% of participants were adult children of alcoholics, and 97% of them were adult children of a dysfunctional family that had experienced domestic violence (25%) or physical abuse (28%) (28). These finding are important to bear in mind for the current study, as the current study population is comprised of African American from disadvantaged neighborhoods in Atlanta. If previous research gives any indication of current disparities, the study sample may be experiencing many of these high-risk health consequences and social problems that accompany cocaine/crack use.

Cocaine and Alcohol Use

Previous studies have established that alcohol and cocaine are frequently used together and that dual dependence is common (29-35). In a nationally representative study of adult DSM-IV alcohol abuse/dependence, alcohol dependence was strongly and statistically significantly associated with all substance use, demonstrating frequent comorbidity between alcoholism and substance use (36). In 1984, the Epidemiologic Catchment Area study interviewed 20,000 individuals, and found that alcohol and cocaine shared dependence more than any other drug, with 84% of participants who admitted to cocaine dependence also meeting criteria for alcohol abuse or dependence

(30). This comorbidity has also been observed specifically among crack cocaine users. In a longitudinal study of crack smokers in Dayton, Ohio, researchers found that alcoholism was common among participants addicted to crack (12). A possible mechanism behind comorbidity of cocaine and alcohol may have been observed in a longitudinal study of non-dependent heavy alcohol drinkers by Rubio and colleagues (34). During a 4-year follow-up, a higher proportion of persons who reported cocaine-use met criteria for alcohol dependence than the persons who drank alcohol only (34). Additionally, the amount of cocaine used was associated with a faster development of alcohol dependence (34). These findings suggest that increased co-use of cocaine and alcohol may influence alcohol dependence.

Polysubstance abuse, which is defined as the ingestion of more than one drug, may happen concurrently on separate occasions, or simultaneously on a single occasion (37, 38). Previous studies have observed various patterns of behavior and prevalence of simultaneous versus concurrent alcohol and cocaine/crack use among different subgroups. This trend of concurrent use was identified in a study analyzing data from the 1985 National Survey on Drug Abuse, where 96.5% of cocaine users reported using alcohol in the same 30 day period (39). More recently in 2000, current drinkers from the National Alcohol Survey were studied for prevalence of cocaine use; among this group, concurrent cocaine/crack use was higher than simultaneous use among women, whereas simultaneous use was more common among men (40). In the current study, researchers will similarly investigate reported concurrent alcohol use among cocaine/crack users and differences among sexes in the sample.

Previous studies have suggested various motivators that may contribute to patterns of cocaine/crack and alcohol use (concurrent versus simultaneous) as well as cocaine's route of administration (snorting powder cocaine versus injecting or smoking crack). Simultaneous use may be more common among powder cocaine users who are motivated to use cocaine in social settings (41, 42). For instance, levels of alcohol dependence has been found to vary between mode of cocaine ingestion; in a cross-sectional study of current drinkers seeking treatment for drug problems, the high-alcohol dependence drinkers were found to be least frequent users of crack cocaine, but were the most frequent users of cocaine powder (43). Similarly, in a separate cross-sectional study of cocaine-dependent adults, alcoholics in the sample were more likely to report snorting cocaine and using cocaine in social settings (44). In a comparison study of powder cocaine and crack cocaine users, both of whom used simultaneously with alcohol, powder cocaine users had statistically significantly higher social motivation for simultaneous cocaine and alcohol use compared to those who smoked crack cocaine(45). Additionally, the crack cocaine users were more likely to be older and have a higher severity of dependence (45). These differences in social motivation and mode of administration have implications for the current study, as there may be observed differences in alcohol consumption among powder cocaine and crack cocaine as well as the relationship between alcohol outlets and cocaine/crack behavior.

Reasons for the simultaneous use of alcohol and cocaine include controlling cravings, altering states of consciousness, managing emotions, enhancing sexual, physical and social functioning, and minimizing financial costs (45). Although previous research has shown alcohol dependence to be more common among frequent users of

cocaine powder rather than crack cocaine and motivations for use to be different, crack users are at particular risk for alcoholism and co-dependence is still significant for both groups (12, 42, 43, 45).

Previous research of cocaine and alcohol report severe health effects of concurrent and simultaneous use. In a study of alcohol dependence among drug misusers, high-dependence drinkers reported more psychological and physical health problems (43). In 2011, illicit drugs were involved in over half of all emergency department visits involving alcohol-drug combinations, with cocaine representing the highest proportion (28.6%) of such visits, demonstrating the danger when using alcohol and cocaine simultaneously (2). However, according to a literature review of concurrent alcohol and cocaine use, there was generally no evidence that the combination of the two drugs had a more severe effect than alone, but noted several exceptions (46). Cocaine was found to aggravate the learning deficit induced by alcohol as well as decreased psychomotor performance (46). Heart rate and blood pressure was also found to be higher when alcohol and cocaine were used together than either alone, which was also observed in a clinical trial of simultaneous cocaine and alcohol (46, 47). Psychological effects of simultaneous use were also presented in a 2005 cross-sectional study of alcohol and/or cocaine-using adults, where concurrent users were found to have higher rates of anxiety and depression (48).

Neighborhood Factors and Social Capital

In the current study, researchers aim to investigate whether neighborhood factors, specifically alcohol outlets, have a relationship with cocaine/crack and alcohol use among individuals in the study sample. Related literature investigating the impact of social

capital and neighborhood impact on health and behavior is expansive. Social capital, as defined by Putnam in 1995, is “features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit“ (49). Neighborhood disorganization similarly refers to the “inability of a community structure to realize the common values of its residents and maintain effective social control” (50). This terms is related to the social constructs of neighborhoods that affect the lives and health of community members.

Low social capital has commonly been associated with poor health as well as negative health behaviors such as alcohol consumption and drug use, an important implication for the current study (51-58). Living in a disadvantaged neighborhood has specifically been associated with earlier exposure to cocaine and higher alcohol availability (59). Other negative effects, such as poor health and risky behaviors may result from perceived neighborhood disorder and be mediated by psychological stress (52, 60). Perceived Neighborhood Disorder is a construct established by Ross and Mirowsky (1999), which measures individual perceptions of neighborhood safety, physical disorder, alcohol and drug use, and relationships with community members (52). Sterk (2014) reported Perceived Neighborhood Disorder being highly associated with frequency of crack cocaine use, and mediated by social context of use (21). Since the current study investigates the relationship between neighborhood factors and substance use, it is important to bear in mind the social context of use, as suggested by previous research. In the current study, perceptions of neighborhood drug and alcohol use will be analyzed in order to assess the how this perception may be related to between alcohol availability, as well as use of alcohol and cocaine/crack. These individual perceptions aim

to act as a proxy for assessing perceived neighborhood disorganization and perceived social capital.

Racial/ethnic composition and educational level of neighborhood residents has been associated with intravenous drug use (61). The racial/ethnic composition of a neighborhood may also effect drug reporting, meaning that current estimates of cocaine/crack use may be lower than actual use (62). Drug arrests have been associated with low income and low education (not completing high school) (63). Demographic characteristics such as income and educational level of individuals in the current study will be examined in context of alcohol and cocaine/crack use in order to investigate how alcohol and drug use may vary across sex, levels of education, and income.

Alcohol Outlets

Alcohol outlets are an important neighborhood factor to consider for the present study, as a wealth of literature has identified alcohol outlets as being associated with a variety of negative effects. Alcohol outlets have been associated with violence as well as other issues such as child maltreatment, pedestrian injury, rates of STI, and other neighborhood problems (64-87). Additionally, research has found density of alcohol outlets to be higher in low-income inner-city neighborhoods and for African Americans, the current population of interest. Using census data on business and counts of socio-demographic characteristics, Romley and colleagues observed the density of alcohol outlets to be higher for blacks than whites, those in urban neighborhoods, and in low-income areas (54, 88). As an implication for the current study, Theall, 2011, found that liquor stores had a significant impact on at-risk alcohol consumption among African-American drinkers, particularly women (89). This research supports the current need to

investigate the relationship between alcohol outlets and substance use among African Americans in inner-city neighborhoods.

Deprived urban areas are often subject to increased presence of alcohol outlets, although not all research has been consistent in this finding (88, 90-94). In 1997, Gorman and colleagues analyzed concentration of liquor outlets and economic disadvantage of Newark, New Jersey, and found that four neighborhoods that occupied one-quarter of the population contained more than half of the liquor outlets in the city (91). Additionally, three of these neighborhoods were considered economically disadvantaged and had large minority populations. It is important to note, however that the neighborhood with the highest concentration of outlets was one that did not suffer from economic disadvantage.

A multitude of research has examined the relationship between alcohol outlet density and alcohol use or alcohol-related problems, as reported in a 2009 literature review by Popova and colleagues (95). This review identified 44 publications from across the U.S that investigated alcohol outlet density, reporting four studies that specifically reported some association between alcohol outlet density and higher frequency or quantity of alcohol consumption (70, 96-98). Not all findings were consistent, as Schonlau and colleagues found that this association was present in Louisiana, but not in Los Angeles County (93).

Previous research has investigated spatial associations between proximity and availability of alcohol with alcohol consumption have also varied in regard to type of alcohol outlet (on-site versus off-site, liquor stores only, etc.) as well as measure of proximity (0.5 miles versus kilometers) and population of interest (college students, high school students, general public, etc.) (89, 96-102). Pasch, 2009 found that the relationship

between alcohol outlets and consumption did not hold for all geographic areas and populations, specifically among suburban youth (103). Picone, 2010 did not observe a significant effect of 0.5 km proximity to bars on quantity of alcohol assumption, though others have speculated that there might be a threshold effect, where if an area is already saturated with alcohol outlets, the addition or subtraction of a relatively low number of outlets will not affect consumption (104). Therefore, it is critical in the current study to investigate whether this association between alcohol outlets and alcohol consumption is present among African Americans in disadvantaged neighborhoods of Atlanta and to detect whether alcohol outlet type as well as alcohol outlet density may influence this relationship.

To the best of our knowledge, no reported studies have investigated the association of alcohol outlets and concurrent alcohol and crack cocaine use. Since cocaine users commonly report concurrent alcohol use, investigating an association between alcohol outlets and crack cocaine use may increase understanding of the association between neighborhood characteristics and crack cocaine use.

The Ecological Approach

When studying the potential association between alcohol outlets on personal drug use, the social-psychological mechanisms that link neighborhood environment to personal behavior need to be considered. Previous researchers have developed and considered various social and behavioral theories that might help explain the mechanisms that connect neighborhood-level factors to high-risk individual behavior.

Bronfenbrenner's Ecological theory suggests that an individual's development is reflective of the systems in their environment, represented in different levels of removal from an individual (105). The chronosystem is the highest over-arching level, which represents environmental events or social circumstances over history; in the application of this theory to the current problem, this may represent the overall disadvantaged circumstances observed in the population of interest, African Americans in inner-city Atlanta. The macrosystem involves the culture of where an individual lives, which in our study represent neighborhood patterns of alcohol or drug may use and the attitudes surrounding these behaviors.

Closer to the individual is the exosystem, which is the system of institutions that indirectly affect individuals, such as zoning policies affecting the density of alcohol outlets in each neighborhood. Closer still to the individual is the mesosystem, which involves interactions that individuals may have with each other; in our study, this may be the social context and motivations of crack cocaine and alcohol use. Lastly, the microsystem is the closest to the individual and for our purposes includes the behavior of peers, family, or neighbors. This ecological model may help explain how the alcohol outlet density of neighborhoods affect the individual drug and alcohol behavior of residents. Appendix II depicts the conceptual model in context of the current study.

CHAPTER TWO

An observational cross-sectional study of alcohol outlets and associated alcohol and cocaine/crack use among African American adults in Atlanta, Georgia

Colleen M. Haynes

Abstract

Cocaine/crack use has been widely recognized as a public health concern that has negative social and health consequences. On average, African Americans in inner-city neighborhoods have higher rates of cocaine/crack use, with which concurrent alcohol use is commonly reported. This group also experiences high alcohol outlet density, which is associated with increased alcohol consumption. The authors used cross-sectional data from the People and Places study to examine concurrent alcohol and cocaine/crack use with the number of alcohol outlets within one mile of African American adult residences in disadvantaged neighborhoods of Atlanta, Georgia. Logistic regression models were used to estimate the association between alcohol outlet density and 30-day concurrent cocaine/crack and alcohol use, exclusive cocaine/crack only use, exclusive alcohol use, and use of neither, while controlling for socio-demographic factors and neighborhood perception of drug/alcohol problems. Off-site alcohol outlets such as liquor stores were statistically significantly associated with 9% higher odds of 30-day exclusive use of cocaine/crack (95% CI: 1.03, 1.15) and 2% higher odds of concurrent cocaine/crack and alcohol use (95% CI: 1.00, 1.04). Conversely, on-site alcohol outlets such as bars had an inverse association with both exclusive cocaine/crack use (OR: 0.97, 95% CI: 0.95, 0.99) and concurrent cocaine/crack and alcohol use (OR: 0.99, 95% CI: 0.98, 0.997). There was no apparent association between off-site or on-site alcohol outlet density and exclusive alcohol use. Increased negative perception of neighborhood drug and alcohol problems was associated with 18% higher reported use of concurrent cocaine/crack and alcohol use ($p<0.0001$). This study supports the possible association between off-site alcohol outlet density and cocaine/crack use, both exclusively and concurrently with alcohol among African American adults in disadvantaged neighborhoods of Atlanta, Georgia.

INTRODUCTION

Cocaine use has been widely recognized as a public health concern. Despite its overall decline in the United States, cocaine was the most frequently cited illicit drug involved in emergency department visits in 2011 and arrests in 2009 (2, 3, 6, 106). African Americans in inner-city neighborhoods in past studies had rates of cocaine/crack use that are two to five times higher than that of the general population (11). African Americans in inner-city neighborhoods are also disproportionately impacted by alcohol outlet density. The density of alcohol outlets are generally higher for blacks than whites, those in urban neighborhoods, and in low-income areas (88). Higher density of alcohol outlets have also been associated with higher levels of alcohol consumption (97, 99, 107). To the best of our knowledge, no reported studies have investigated the association of alcohol outlets and concurrent alcohol and crack cocaine use. Since cocaine users commonly report concurrent alcohol use, investigating an association between alcohol outlets and crack cocaine use may increase understanding of the association between neighborhood characteristics and crack cocaine use(29, 39, 40, 106). We used cross-sectional data from the *People and Places* study to examine the presence of alcohol outlets in within a one-mile radius of residences African American adults in inner-city Atlanta and concurrent alcohol and cocaine/crack use (21).

Our primary objectives were to 1) investigate the association between individual proximity to on-site or off-site alcohol outlets associated with self-reported 30-day alcohol and cocaine/crack use, 2) examine individual neighborhood perceptions of alcohol and drug use and self-reported 30-day alcohol and cocaine/crack use, and 3)

identify demographic differences between participants whom self-reported 30-day alcohol and/or crack cocaine use and participants whom reported use of neither.

METHODS

Data

The data for this paper were collected for *People and Places*, a large-scale community-based cross-sectional survey of focus on drug use, neighborhood perceptions, social psychological characteristics, and situational characteristics (21). The *People and Places* study was also comprised of data collected using systematic observations of neighborhood physical infrastructure and social processes, data from the U.S. Census, and part 1 crime data and drug arrest data from the Atlanta Police Department. The *People and Places* study was designed to achieve a better understanding of multiple levels of influences on health and health-related behaviors. The secondary analysis of this dataset was exempt by the Institutional Review Board at Emory University as non-human research. The present study focuses on participant neighborhood perceptions, alcohol outlet data from municipal source, alcohol use, and cocaine/crack use.

The inclusion criteria for the *People and Places* study were that participants must have been Atlanta-resident men and women who self-identified as either African American, black, or African. Participants include adults at least 18 years old, and must have lived in the same census block group at least 12 months prior to the interview. Exclusion criteria were currently being in drug treatment or any other institutional setting, being intoxicated, or being cognitively impaired.

The *People and Places* study recruited 1,864 African American adults from 75 census block groups across Atlanta, GA. Non-probability quota sampling was used to provide approximately equal distribution across age, sex, and drug-use status by census block groups with the goal of making comparisons between groups rather than having a

representative sample of the underlying population. Study participants were recruited using active (community outreach and street intercept methods) and passive methods (e.g., posters) between May 2009 and March 2012.

Participant interviews were conducted in a private room at a centrally located research site in one of the study neighborhoods by trained interviewers using computer-assisted technology. A detailed questionnaire was used to gather detailed information on demographic factors, racial importance, reproductive health, sexual health, alcohol and cigarette use, illicit drug use, general health, crime and abuse history, neighborhood perceptions, and social support. At the completion of the interview, each respondent was paid $30 for participating in the study as well as offered referrals to local health/social service agencies. The Institutional Review Board at Emory University approved the study protocol before implementation.

Drug and Alcohol Use

Frequency of powder cocaine and crack cocaine was operationalized as the number of days a respondent reported using the drug during the 30 days preceding the interview. Since approximately half of powder cocaine users in the sample also reported use of crack cocaine within the past 30 days, these groups were combined for analysis to assess cocaine/crack. Frequency of alcohol use was similarly operationalized as the number of days a respondent reported consuming alcohol during the 30 days preceding the interview. Both of these variables were used to create binary (1=yes, 0=no) variables indicating if the respondent used cocaine/crack within the past 30 days, alcohol within the past 30 days, or both. A respondent was considered a concurrent cocaine/crack and alcohol user if the respondent reported both alcohol and cocaine/crack use during the 30

days preceding the interview (yes=1, no=0). If the respondent recorded no cocaine/crack or alcohol use within the past 30 days, they were categorized as a user of neither.

Demographic Variables

Age was measured in years and was entered into the model as a continuous variable. Education ranged from "no schooling" to "doctorate or equivalent degree" and was collapsed into three categories: "less than high school", "high school or GED equivalent", and "more than high school" for analysis. Income was measured in dollars per month and categorized into tertiles: $0-$350, $351-$850, and more than $850. Employment status was categorized as unemployed (no current job, unemployed and looking/not looking for work, in school and not working, on welfare, unable to work, homemaker, retired), or employed (working full-time, part-time, have a seasonal job, or employed and on welfare).

Neighborhood Perceptions

Neighborhood perceptions regarding drug sales/use and alcohol use were measured on a Likert scale. Respondents were asked to respond to two statements: "There is too much alcohol use in my neighborhood" and "There is too much drug use in my neighborhood". Responses ranged from strongly disagree (1) to strongly agree (5). Respondents were also asked to respond to the statement, "Drug use and drug sales are a problem in my neighborhood". Possible responses ranged from very true (1) to not true (4). For all three perception measurements, responses that included "I don't know" or "Refused to answer" were recoded as missing. These three variables were combined to

create a Neighborhood Perception Score variable ranging from 3 to 14 and entered into the model as a continuous variable.

Alcohol Outlet

Alcohol outlet type and location was collected using alcohol outlet data from city datasets. Alcohol outlets were defined as on-site outlets if alcohol was served in the establishment and not taken off property (e.g., club, tavern, lounge, and restaurants). Alcohol outlets were defined as off-site outlets if alcohol could be purchased and removed from the establishment (e.g., liquor store, package store, convenience store). "All outlets" is an all-inclusive variable measuring both on-site and off-site alcohol outlets. Proximity to alcohol outlets (on-site/off-site) was measured by identifying the subjects' address and summarizing the number of alcohol outlets within a one-mile radius. A one-mile radius was used for the final analysis since this captured the largest neighborhood area for individuals in the sample and displayed the clearest trend with the substance use of interest in the current study. This distance is also used in previous literature and was employed here for consistency.

Statistical Analysis

All calculations and analyses were conducted using SAS, version 9.3 (SAS Institute, Cary, NC). All variables of interest were assessed for missing data and implausible values. No observations were out of range and 96.2% participants had no missing data. No variables were missing an unacceptable amount of data, decided a priori to be 5% (108).Of the demographic variables of interest, employment status was missing for 35 (1.9%) respondents and income was missing for 2 (0.1%) respondents. Missing

data for substance use variables was low, with 18 (1.0%) of respondents missing data for reported cocaine/crack use, and only one individual was missing data for reported alcohol consumption. Due to the low occurrence of missing responses, it was determined to not undermine the validity of the analysis and list-wise deletion was used to drop any cases with missing data from the models.

Demographic covariates were first identified for inclusion in the model according to previous studies from the literature review. These covariates included age, sex, income, and education. Additional covariates such as neighborhood perception of drug and alcohol problems were included in the model according to the research aims of the current study, with a goal being to assess how one's perception of neighborhood alcohol and drug problems may be associated with individual substance use. The main exposure of interest is on-site and off-site alcohol outlet density, which was measured as the frequency of on-site and off-site alcohol outlets within one mile of the participant's address.

Selected characteristics of the study participants were summarized using a descriptive analysis; mean and standard deviations were calculated for continuous variables, and frequencies and proportions were calculated for categorical variables. Descriptive statistics were stratified by cocaine/crack-only users, alcohol-only users, concurrent cocaine/crack and alcohol users, and users of neither, then compared using the ANOVA for continuous variables and chi-square methods for categorical variables.

Four multiple logistic regression models were used to assess the relationship between neighborhood alcohol outlet density and the outcome of concurrent alcohol and cocaine/crack use, cocaine/crack-only use, or alcohol-only use, while controlling for

covariates. Demographic, drug use, and neighborhood perception variables were entered into a logistic regression model as independent variables using a forward selection method for each substance use in the past 30 days being the dependent variable: cocaine/crack-only, alcohol-only, concurrent alcohol and crack cocaine, or neither. If a covariate was significant according to forward selection in any of the models, it was included in all four models for comparison purposes.

Each model was assessed for multi-collinearity among the covariates, using a Conditional Index cut-point of 30 and a Variance Decomposition Proportion cut-off of 0.05. In this analysis, the three neighborhood perception variables were found to be multi-collinear. The three variables were combined into a single score assessing neighborhood perception of drugs/alcohol on a scale of 3 to 14. After this new Neighborhood Perception Score variable was substituted, no multi-collinearity issues were present.

Regression diagnostics were used to identify outliers and influential observations for each model. Several continuous variables were identified as having multiple outliers that potentially impacted the estimated betas, including income. To address this problem, income was categorized into tertiles. The Hosmer-Lemeshow Goodness-of-Fit test was used to assess the suitability of the models. ROC curves were used to calculate AUC and assess the discrimination of each model.

RESULTS

Sample

Select socio-demographic characteristics of the total sample are presented in Table 1. The sample of 1,864 respondents were comprised of 56.2% men, and the average age was 37 years old. The proportion of respondents who had completed less than a high school education and those that had completed education up to a high school diploma or equivalent GED were roughly equivalent (39.0% and 38.7%, respectively), while only 22.4% of the sample had completed more higher than a high school education. The average monthly income of respondents in the sample was $834/month and 72.4% of respondents reported being unemployed. Tertiles of monthly income were grouped into categories of $0 – $350, $351 - $850, and more than $850, all of which contained approximately one-third of the sample.

Reported cocaine/crack and alcohol use is presented in Table 2. Of the total sample, 12% of respondents reported using powder cocaine, 24% reported using crack cocaine, and 72% reported consuming alcohol within the 30 days leading up to the interview. Of powder cocaine users, 5% reported concurrent alcohol use, and 22% of crack cocaine users reported concurrent alcohol use. There were 110 cocaine users that reported both powder and crack cocaine use, and therefore both groups were grouped together in analysis as cocaine/crack users, representing 30% of the total sample. Mutually exclusive categories of substance use consisted of 3% cocaine/crack-only users, 45% alcohol-only users, 27% concurrent users, and 25% respondents who reported using neither within the past 30 days.

Neighborhood drug and alcohol perceptions for the total sample are presented in Table 3. The majority of respondents said that the statement "Drug use and drug sales are a problem in my neighborhood" was either true (37%) or very true (29%), with only 19% responding that the statement was not true. Almost half (49%) of respondents agreed and 25% strongly agreed with the statement, "There is too much drug use in my neighborhood", while only 17% of respondents disagreed. Similar results were found for responses to "There is too much alcohol use in my neighborhood", with 48% of respondents agreeing, 25% strongly agreeing, and only around 17% disagreeing.

The number of alcohol outlets within proximity to individuals in the total sample are presented in Table 4. The average number of alcohol outlets within 0.25 miles of individuals within the sample was 1.7, with a large proportion of these being off-site. The number of any type of alcohol outlet within 0.5 miles of individuals in the sample increased to 6.5, again being comprised mostly of off-site outlets. The average number of all alcohol outlets within 1 mile of individuals in the sample was 32.2, with an average of 14.7 on-site and 17.6 off-site outlets.

Descriptive Statistics

Select demographic characteristics of 30-day cocaine/crack-only users, alcohol-only users, concurrent users, and users of neither are presented in Table 5. Alcohol-only and concurrent users, on average, were more likely to be male, whereas cocaine/crack-only users and users of neither were more likely to be female, with this difference being statistically significant (X^2= 19.43, p=0.0002). The average age of cocaine/crack users was generally older than alcohol-only users or users of neither, with the average age of concurrent users being 44.5 years old and those who used neither being 31.9 years old (*F*

=95.08, p<0.0001). Level of education was observed to be slightly different among substance-use groups in the sample, although not statistically different (X^2 = 11.86, p=0.07), with cocaine/crack-only users having the highest proportion of high school/GED-level completion (46.5%), concurrent users having the highest proportion of less than high school-level completion (41.4), and alcohol-only users having the highest proportion of more than high school-level completion (24.9%). Alcohol-only users had the highest proportion of respondents (36.8%) within the highest tertile of monthly income, whereas concurrent users were observed to have the proportion of respondents within the highest tertile of income for the sample (26.6%). Cocaine/crack-only users had the highest proportion of respondents in the lowest tertile of monthly income (37.3%), with these differences observed being statistically significantly different (X^2 = 16.2, p<0.05). Employment rates were similarly different among groups, with concurrent users having the highest proportion of unemployed individuals (79.3%), followed by cocaine/crack-only users (78.9%), and alcohol-only users having the lowest observed unemployment among the groups (70.3%) (X^2= 13.59, p=0.004).

Neighborhood drug and alcohol perceptions of 30-day cocaine/crack-only users, alcohol-only users, concurrent users, and users of neither are presented in Table 6. Responses to "Drug use and drug sales are a problem in my neighborhood*"* were statistically significantly different among groups, with cocaine/crack only users being more likely to say the statement was "true" (42.3%) or "very true" (38.5%), which contrasts with users of neither cocaine/crack or alcohol, of which 25.3% said the statement was "not true" (x^2 = 24.21, p<0.0001). Responses to the statements "Too much drug use in my neighborhood" and "Too much alcohol use in my neighborhood" had

similar results, with cocaine/crack-only and concurrent users having the highest proportion of responses expressing agreement with the statement and observed responses being statistically significantly different among groups (x^2= 21.89, p<0.0001, and x^2 = 17.30, p=0.0006, respectively).

The average number of alcohol outlets within 0.25, 0.5, and 1.0 miles to 30-day cocaine/crack-only users, alcohol-only users, concurrent users, and users of neither are presented in Table 7. The average number of off-site alcohol outlets were found to be statistically significantly different among groups at a 0.25 and 0.50 mile distance to individuals within the sample, with cocaine/crack-only users having the highest average number of off-site outlets in proximity at both distances and users of neither having the lowest average number of off-site alcohol outlets within 0.25 and 0.50 miles (F=2.65, p=0.05, and F=3.10, p=0.03, respectively). Respondents within the cocaine/crack-only group had the lowest average number of on-site alcohol outlets within a mile of their home (13.0), with users of neither alcohol nor cocaine/crack having the highest (15.3). Conversely, the highest number of off-site alcohol outlets within a mile-radius of respondents was highest for cocaine/crack only users ($\bar{x}$ = 19.5) and lowest for users of neither alcohol nor cocaine/crack ($\bar{x}$ =16.7).The average number of alcohol outlets within one-mile radius of respondent's homes was not a statistically significant different between user groups.

Crude Associations

Unadjusted associations derived from bivariate logistic regressions for socio-demographic variables, neighborhood perception, and on-site and off-site alcohol outlet

density within a one-mile radius of participants' homes are presented in Table 8 for cocaine/crack-only users, alcohol-only users, concurrent users, and users of neither.

Sex, age, and lower tertiles of income were all positively associated with exclusive cocaine/crack use when analyzed independently, but not all were statistically significant. Age was the only variable that was statistically significantly associated with exclusive 30-day use of cocaine/crack, with 34% increased odds of use with every increased year of age ($p<0.05$). Neighborhood Perception Score and number of off-site alcohol outlets was positively associated with reported cocaine/crack-only use, while on-site alcohol outlet density was negatively associated with exclusive 30-day cocaine/crack use.

Sex, age, lower levels of education, and the two lowest tertiles of income were all negatively associated with reported 30-day alcohol-only use. Men in the sample were 20% less likely to report exclusive 30-day alcohol use ($p < 0.05$). Odds of exclusive alcohol only-use was 2% lower for every increased year of age (COR: 0.98, 95% CI:0.98, 0.99). The middle tertile of income was statistically significantly associated with lower odds of alcohol-only use, compared to the highest tertile of income (COR: 0.82, 95% CI; 0.67, 0.99). Being employed was positively associated with use of alcohol-only, with those employed being 1.4 times more likely to use alcohol exclusively within the past 30 days (COR: 1.39, $p < 0.01$). There were no observed crude associations between on-site and off-site alcohol outlets with alcohol-only use.

Age, lower tertiles of income, having completed less than a high school education, and Neighborhood Perception Score were positively associated with concurrent cocaine/crack and alcohol use. Being male and employed were both

statistically significantly associated with 19% and 33% lower odds of reported concurrent use, respectively. There was no observed bivariate association between alcohol outlet density and concurrent use of cocaine/crack and alcohol.

Being male and having completed a high school or GED equivalent education were both positively and statistically significantly associated with odds of using neither alcohol nor cocaine/crack within the past thirty days. Age was inversely associated with use of neither substance, with 4% lower odds of using neither with every increased year of age (95% CI: 0.95, 0.96, $p<0.0001$). Neighborhood Perception Score was also crudely associated with use of neither substance (COR: 0.90, 95% CI: 0.84, 0.97). Again, there was no crude association observed between alcohol outlet density and use of neither substance.

Logistic Regression Analysis Results

Adjusted associations of socio-demographic variables, neighborhood perception, and one-mile on-site and off-site alcohol outlet density are presented in Table 9 for cocaine/crack-only users, alcohol-only users, concurrent users, and users of neither. Advanced age was the only demographic factor statistically significantly associated with reported 30-day cocaine/crack-only use was, with odds of use increasing by 3% for every increased year of age (95% CI: 1.01, 1.05, $p<0.05$). On-site alcohol outlet density within one-mile of the participants' residence was statistically significantly inversely associated with 30-day cocaine/crack-only use (AOR: 0.97; 95% CI: 1.01, 1.05), while off-site alcohol outlet density was positively associated with 30-day cocaine/crack-only use (AOR: 1.09, 95% CI: 1.01, 1.15). Reported exclusive use of cocaine/crack was weakly

associated with lower tertiles of income and lower levels, but these associations were not found to be statistically significant.

Multiple demographic variables were statistically significantly associated with 30-day alcohol-only use, while one-mile radius on-site and off-site alcohol outlets density had no observed association. Odds of 30-day alcohol-only use was approximately 25% lower for males, 2% lower for every increased year of age, and approximately 27% lower for individuals with both below or high school/equivalent education. The two lowest tertiles of monthly income ($0-$350, and $351-$850) had approximately 25% and 26% lower odds of reporting alcohol-only use, respectively ($p < 0.05$).

Age, education, and income were statistically significantly associated with 30-day concurrent cocaine/crack and alcohol use, as well as individual Neighborhood Perception Score, and density of on-site and off-site alcohol outlets, while controlling for all other covariates in the model. For each increased year of age, odds of concurrent use increased by 7% (95% CI: 1.06, 1.08, $p < 0.0001$). Education completion lower than high school was positively associated with concurrent use, with odds of use being 42% higher compared to those with more than a high school education (95% CI: 1.05, 1.92, $p < 0.05$). Both lower tertiles of monthly income had statistically significantly higher odds of reported concurrent use, roughly 1.6 times higher odds of use when compared to the highest tertile of income.

Neighborhood Perception Score was also positively associated with concurrent use, indicating that a higher perception of neighborhood drug and alcohol problems was associated with increased odds of reported concurrent use (AOR: 1.18, 95% CI:1.09, 1.28). Following the same trend as cocaine/crack-only users, on-site alcohol outlets had

an inverse relationship with reported concurrent cocaine/crack and alcohol use, while the one-mile density off-site alcohol outlets had a positive association with use. For every additional on-site alcohol outlet within a one-mile radius, odds of reported 30-day concurrent use decreased by 1%, while odds of concurrent cocaine/crack and alcohol use increased by 2% with every additional off-site alcohol outlet.

Sex, age, Neighborhood Perception Score, and one-mile on-site and off-site alcohol outlet density was significantly associated with the odds of reporting neither cocaine/crack nor alcohol use within the past 30 days, while controlling for other covariates in the model. Men in the study had 47% higher odds of reporting use of neither substance compared to women (95% CI: 1.17, 1.84, $p < 0.001$). Additionally, for every increased year in age, odds of reporting use of neither substance was statistically significantly lower by 4% (95% CI: 0.95, 0.97, $p < 0.0001$). Neighborhood Perception Score was inversely associated with reported use of neither drug, with lower perception of neighborhood drug and alcohol problems being associated with increased odds of reporting use of neither substance.

DISCUSSION

The results of the current study suggest an association between one-mile alcohol outlet density and cocaine/crack use, both exclusively and concurrently with alcohol among African American adults within disadvantaged neighborhoods of Atlanta, Georgia. Overall, alcohol outlets were common, with a mean of thirty-two alcohol outlets within one-mile of survey respondents, and cocaine/crack use was widespread. A key observation was the opposite association of off-site and on-site alcohol outlet density with odds of cocaine/crack and concurrent cocaine/crack and alcohol use. Off-site alcohol outlets such as liquor stores are associated with higher reported 30-day concurrent alcohol and cocaine/crack use as well as exclusive use of cocaine/crack while controlling for socio-demographics. Conversely, on-site alcohol outlets such as restaurants and bars are associated with lower reported exclusive 30-day cocaine/crack use and concurrent alcohol and cocaine/crack use.

Although a specific causal link between alcohol outlets and cocaine/crack use may not be observed in the current study, social-psychological mechanisms that link neighborhood environment to personal behavior support the plausibility of the authors' findings. Previous researchers have developed and considered various social and behavioral theories that might help explain the mechanisms that connect neighborhood-level factors to high-risk individual behavior. The authors of the current study specifically considered Bronfenbrenner's Ecological theory in the development of their study aims. This behavioral theory suggests that an individual's behavior is reflective of the systems in their environment, represented in different levels of removal from an individual (105). Neighborhood disadvantage and alcohol outlet density at the exosystem

level may affect attitudes surrounding alcohol and drug use of the community at the macrosystem level, further translating toward individual motivations surrounding use of alcohol or cocaine/crack on the mesosystem. Alternatively, personal use of cocaine/crack may affect one's perceptions of neighborhood drug and alcohol problems, contributing toward the lack of perceived autonomy in the community. There is speculation in current research as to whether undesirable businesses such as liquor stores contribute toward neighborhood disadvantage, or if these businesses move into areas that already undesirable neighborhoods that exhibit characteristics of a profitable market for alcohol and other substances. Although this study does not establish causality or a directional relationship, but does highlight an association between illicit substance use and alcohol outlets.

Since not all studies investigating the association between alcohol outlet density and related alcohol consumption are unanimous in their findings, the results of the present study are supported by some previous observational studies and conflict with others. In the current study, odds of exclusive consumption of alcohol within the past 30 days was higher for women, which similarly was observed by Picone and colleagues in a longitudinal study of four major U.S. cities from 1985 to 2001 (104). In the previous study, on-site and off-site alcohol outlets were assessed separately within a 0.5 km radius of individuals and observed no association between off-site alcohol outlet density and alcohol consumption. Similarly, a cross-section study conducted by Schonlau investigating alcohol outlet density in Los Angeles county and southern Louisiana found that alcohol outlet density was not associated with the percentage of people who were drinkers in either site (98). Notably, Schonlau and colleagues did find that alcohol outlet

density within a one-mile radius of the respondents' home was associated with the quantity of consumption among drinkers in one of the two cities, an outcome that was not measured in the current study (98). Since the quantity and frequency of alcohol consumption on respondents in the current study were not assessed, the null association between alcohol outlet density and 30-day alcohol-only use may be attributed to the heterogeneity within the group.

Many socio-demographic characteristics associated with cocaine/crack use in the current study are supported from previous research. In the current study, age was statistically significantly associated with cocaine/crack use, as has also been observed in previous studies. Most recently, the Drug Abuse Warning Network's estimates of drug-related emergency visits in 2011 found similar risk among older age groups, as 45-54 year-olds had the highest rate of cocaine-related visits (2). Similarly, in a 2013 cross-sectional study, Golub and colleagues found that arrestees born before 1970 had the highest proportion of cocaine/crack users (1). In a cross-sectional study of concurrent alcohol and drug use, respondents within the sample that completed less than high school education had higher risk for concurrent alcohol and drug use, which was also observed in the current study (40).

Strengths and Limitations

A strength of the current study is the sampling method used to reach users in resource poor urban neighborhoods that may not be seeking treatment, in contrast to many previous studies which only studied users in treatment facilities. This allows further insight into the risks and behaviors of this hard-to-reach group of users.

This study was subject to several limitations. The cross-sectional data used for this investigation permit observation of possible associations between suspected risk factors and substance use, but does not allow the observation of cause-effect relationships. Additionally, the sampling method used to collect data for this study was non-probability and may not be representative of cocaine/crack users in the study area. Respondents' self-reported information about drug use may have been subject to social desirability bias. This limitation was addressed to the best of the researchers' abilities by training interviewers to be sensitive toward potential bias. Recall bias may be an issue, but since authors mitigated this potential source of bias by using only a 30-day recall period and by using binary classifications for substance use, which may have been subject to less error.

Use of alcohol and cocaine/crack was assessed as a binary (yes/no) outcome, which did not allow the authors to consider frequency of use or quantity of consumption. This did not allow the analysis to identify or consider the difference between high-risk users that may meet criteria for dependence and low-risk or occasional users. This heterogeneity within the user groups may have contributed towards the null association observed between alcohol outlet density and exclusive use of alcohol. Additional social or demographic characteristics of individuals within the sample such as incarceration or religiosity may have allowed further understanding of the association between neighborhood factors and individual substance use, but were not addressed here. This highlights opportunity for further research to investigate research questions that authors were not able to address in the current study.

Even with limitations, this study supports the possible association between alcohol outlet density and cocaine/crack use, both exclusively and concurrently with

alcohol consumption among African American adults within disadvantaged neighborhoods of Atlanta, Georgia. Although previous literature is extensive regarding alcohol outlets and alcohol consumption, violence, and other negative social outcomes, research investigating alcohol outlet density in association with cocaine/crack is limited. The current study supports further research investigating the association between illicit drugs and alcohol outlet density. Future steps include assessing the quantity and frequency of alcohol and cocaine/crack use in association with alcohol outlet density, and investigating use of powder cocaine and crack cocaine separately. Implications of the findings from the current study support targeted interventions, surveillance, and zoning policy changes within the investigated population.

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TABLES

Table 1. Selected socio-demographic characteristics among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variable	**Total Sample (*n* = 1,864)**
	n (%)
Sex	
Men	1,047 (56.2)
Women	817 (43.8)
Age, years; *Mean (s.d.)*	37.3 (13.1)
Education	
< High School	726 (39.0)
HS/GED	721 (38.7)
> High School	417 (22.4)
Monthly Income (Tertiles)	
$0 – 350	629 (33.7)
$351 - 850	619 (33.2)
> $850	614 (32.9)
Missing	2 (0.1)
Employment	
Employed	479 (25.7)
Unemployed	1,350 (72.4)
Missing	35 (1.9)

Table 2. Select crack cocaine, powder cocaine, combined crack/cocaine and alcohol-related behaviors among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variable	**Total Sample (*n* = 1,864)**		
	Powder Cocaine	**Crack Cocaine**	**Alcohol**
Past 30 days			
Used *(n, %)*	225 (12.1)	440 (23.6)	1,341 (71.9)
Number of days used, *mean (s.d.)*	1.4 (5.1)	4.0 (8.9)	9.6 (11.4)
Exclusive use of substance, *n (%)*	34 (0.8)	38 (2.0)	838 (45.0)
Concurrent use with alcohol, *n (%)*	99 (5.3)	402 (21.6)	N/A
Total cocaine/crack users, *n (%)*	555 (29.8)		
Past 90 days			
Used *(n, %)*	267 (14.3)	461 (24.7)	1,458 (78.2)
Number of days used, *mean (s.d.)*	4.4 (15.7)	12.1 (26.5)	27.8 (33.3)
Exclusive use of substance, *n (%)*	12 (0.6)	33 (1.8)	912 (48.9)
Concurrent use with alcohol, *n (%)*	116 (6.2)	428 (23.0)	N/A
Total cocaine/crack users, *n (%)*	591 (31.71)		
Categories of Use – 30 days		**Total Sample**	
Cocaine/crack only, *n (%)*		52 (2.79)	
Alcohol only, *n (%)*		838 (45.0)	
Concurrent use, *n (%)*		503 (27.0)	
Neither, *n (%)*		470 (25.2)	

[a] Summary score of previous three drug and alcohol perception responses, ranging 3 - 14

Table 3. Neighborhood drug and alcohol perceptions of total sample among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variable	**Total Sample (*n* = 1,864)**	
	n	*(%)*
"Drug use and drug sales are a problem in my neighborhood"		
Very true	537	(28.8)
True	686	(36.8)
Somewhat true	290	(15.6)
Not true	349	(18.7)
Missing	2	(0.1)
"Too much drug use in my neighborhood"		
Strongly disagree	53	(2.8)
Disagree	309	(16.6)
Neither agree or disagree	111	(6.0)
Agree	910	(48.8)
Strongly Agree	478	(25.6)
Missing	3	(0.2)
"Too much alcohol use in my neighborhood"		
Strongly disagree	42	(2.3)
Disagree	323	(17.3)
Neither agree or disagree	130	(7.0)
Agree	902	(48.4)
Strongly Agree	466	(25.0)
Missing	1	(0.1)
Neighborhood Perception Score[a] *(mean, s.d.)*	9.8	(1.5)

Table 4. Individual alcohol outlet density among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variable			
	Min - Max	*Mean (s.d.)*	*Total*
All (on-site and off-site) within 0.25 miles	0 - 9	1.7 (1.8)	3,167
On-site outlets within 0.25 miles	0 - 8	0.4 (0.8)	726
Off-site outlets within 0.25 miles	0 - 8	1.3 (1.4)	2,438
All (on-site and off-site) within 0.50 miles	0 - 40	6.5 (5.1)	12,158
On-site outlets within 0.50 miles	0 - 30	2.0 (3.5)	3,707
Off-site outlets within 0.50 miles	0 -12	4.5 (2.6)	8,442
All (on-site and off-site) within 1.00 miles	3 - 191	32.2 (34.5)	60,050
On-site outlets within 1.00 miles	0 - 139	14.7 (26.6)	27,441
Off-site outlets within 1.00 miles	2 - 57	17.6 (9.4)	32,721

Table 5. Comparisons of select socio-demographic characteristics by 30-day use of cocaine/crack and alcohol among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variables	**Cocaine/ crack Only (*n* =52)**	**Alcohol Only (*n* = 838)**	**Concurrent (*n* = 503)**	**Neither (*n* = 470)**	**Significance**
	n (%)	*n (%)*	*n (%)*	*n (%)*	*X^2/F(df)*
Sex					
Men	25 (48.1)	496 (59.2)	300 (59.6)	226 (48.1)	$X^2(3)$ =
Women	27 (51.9)	342 (40.8)	203 (40.4)	244 (51.9)	19.4**
Age (years)					
Mean (s.d.)	41.9 (10.5)	35.8 (12.6)	44.5 (10.1)	31.9 (13.6)	*F* = 95.1***
Education					
< HS	18 (34.6)	315 (37.6)	208 (41.4)	184 (39.2)	$X^2(6)$ = 11.9
HS/GED	24 (46.5)	314 (37.5)	182 (36.2)	201 (42.8)	
> HS	10 (19.2)	209 (24.9)	113 (22.5)	85 (18.1)	
Monthly Income					
$0 - $350	19 (37.3)	271 (32.4)	179 (35.6)	159 (33.8)	$X^2(9)$ = 16.2†
$351- $850	18 (35.3)	258 (30.8)	190 (37.8)	153 (32.6)	
> $850	14 (27.5)	308 (36.8)	134 (26.6)	158 (33.6)	
Employment					
Unemployed	41 (78.9)	577 (70.3)	387 (79.3)	344 (73.7)	$X^2(3)$ = 13.6*
Employed	11 (21.2)	244 (29.7)	101 (20.7)	123 (26.3)	

******* $p < 0.0001$; ****** $p<0.001$; ***** $p<0.01$; † $p<0.05$;

Table 6. Comparisons of neighborhood drug and alcohol perceptions by 30-day cocaine/crack and alcohol behavior among African American Adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variables	**Cocaine/crack Only (*n* =52)**	**Alcohol Only (*n* = 838)**	**Concurrent (*n* = 503)**	**Neither (*n* = 470)**	**Significance**
	n (%)	*n (%)*	*n (%)*	*n (%)*	$X^2/F(df)$
"Drug use and drug sales are a problem in my neighborhood"					
Very true	20 (38.5)	229 (27.3)	149 (29.6)	138 (29.4)	$X^2(3)$ =
True	22 (42.3)	291 (34.7)	233 (46.3)	140 (29.8)	24.2***
Somewhat true	4 (7.7)	147 (17.5)	66 (13.1)	73 (15.5)	
Not true	6 (11.5)	169 (20.2)	55 (10.9)	119 (25.3)	
"Too much drug use in my neighborhood"					
Strongly disagree	0 (0.0)	22 (2.6)	7 (1.4)	24 (5.1)	$X^2(3)$ =
Disagree	7 (13.5)	151 (18.0)	52 (10.3)	99 (21.2)	21.9***
Neither	0 (0.0)	63 (7.5)	22 (4.4)	26 (5.6)	
Agree	28 (53.9)	397 (17.4)	286 (56.9)	198 (42.3)	
Strongly agree	17 (32.7)	204 (14.4)	136 (27.0)	121 (25.9)	
"Too much alcohol use in my neighborhood"					
Strongly disagree	0 (0.0)	19 (2.3)	4 (0.8)	19 (4.0)	$X^2(3)$ =
Disagree	10 (19.2)	151 (18.0)	59 (11.7)	103 (21.9)	17.30**
Neither	0 (0.0)	65 (7.8)	25 (5.0)	39 (8.3)	
Agree	29 (55.8)	407 (48.6)	282 (56.1)	184 (39.2)	
Strongly agree	13 (25.0)	195 (23.3)	133 (26.4)	125 (26.6)	
Neighborhood Perception Score[a]					
Mean (s.d.)	9.8 (1.3)	9.8 (1.5)	10.0 (1.3)	9.6 (1.6)	$F(3) = 5.19^{\dagger}$

******* $p < 0.0001$; ****** $p<0.001$; ***** $p<0.01$; † $p<0.05$;

Table 7. Comparisons of average individual alcohol outlet density by 30-day use of cocaine/crack and alcohol among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variables	**Cocaine/crack Only (*n* =52)**	**Alcohol Only (*n* = 838)**	**Concurrent (*n* = 503)**	**Neither (*n* = 470)**	**Significance**
	Mean (s.d.)	*Mean (s.d.)*	*Mean (s.d.)*	*Mean (s.d.)*	*ANOVA*
All / 0.25 mi.	2.2 (2.1)	1.7 (1.8)	1.8 (1.7)	1.6 (1.7)	*F(3)* = 2..24
On-site	0.4 (1.0)	0.4 (0.8)	0.4 (0.8)	0.4 (0.9)	*F(3)* = 0.30
Off-site	1.7 (1.6)	1.3 (1.4)	1.4 (1.3)	1.2 (1.4)	*F(3)* = 2.65†
All / 0.50 mi.	7.1 (4.2)	6.5 (5.2)	6.7 (5.1)	6.4 (5.0)	*F(3)* = 0.54
On-site	1.7 (2.8)	2.0 (3.5)	2.1 (3.5)	2.0 (3.4)	*F(3)* = 0.24
Off-site	5.4 (2.5)	4.5 (2.6)	4.6 (2.7)	4.3 (2.5)	*F(3)* = 3.10†
All /1.0 mi.	32.5 (24.7)	32.8 (37.3)	31.5 (29.7)	31.9 (35.3)	*F(3)* = 0.18
On-site	13.0 (19.1)	15.2 (28.6)	13.5 (22.5)	15.3 (27.6)	*F(3)* = 0.58
Off-site	19.5 (7.1)	17.7 (10.0)	18.0 (8.7)	16.7 (9.3)	*F(3)* = 2.54

******* $p < 0.0001$; ****** $p<0.001$; ***** $p<0.01$; † $p<0.05$

Table 8. Bivariate logistic regression of hypothesized risk factors with 30-day cocaine/crack use, alcohol use, concurrent cocaine/crack and alcohol use and use of neither among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variable	**Cocaine/crack Only (n=52)**	**Alcohol Only (n=838)**	**Concurrent (n=503)**	**Neither (n=470)**
	COR (95% CI)	*COR (95% CI)*	*COR (95% CI)*	*COR (95% CI)*
Male	1.40 (0.81, 2.43)	0.80 (0.67, 0.96)†	0.81 (0.66, 1.00)†	1.55 (1.26, 1.91)***
Age	1.34 (1.06, 1.70)†	0.98 (0.98, 0.99)***	1.06 (1.05, 1.07)***	0.96 (0.95, 0.96)***
Education				
< High School	0.83 (0.46, 1.47)	0.90 (0.75, 1.09)	1.14 (0.93, 1.41)	1.01 (0.82, 1.26)
High School/GED	1.37 (0.79, 2.39)	0.91 (0.75, 1.10)	0.87 (0.70, 1.07)	1.25 (1.01, 1.55)†
> High School	*(referent)*	*(referent)*	*(referent)*	*(referent)*
Income[a]				
$0 - $350	1.17 (0.66, 2.08)	0.90 (0.74, 1.09)	1.12 (0.91, 1.39)	1.01 (0.81, 1.25)
$351- $850	1.10 (0.61, 1.97)	0.82 (0.67, 0.99)†	1.32 (1.07, 1.64)†	0.96 (0.77, 1.20)
> $850	*(referent)*	*(referent)*	*(referent)*	*(referent)*
Employed	0.75 (0.38, 1.47)	1.39 (1.13, 1.71)*	0.66 (0.52, 0.85)*	1.01 (0.80, 1.28)
NPS[b]	1.03 (0.85, 1.24)	0.98 (0.92, 1.04)	1.14 (1.06, 1.22)**	0.90 (0.84, 0.97)*
On-site alcohol outlets, 1 mile	0.99 (0.99, 1.01)	1.00 (1.00, 1.01)	1.00 (0.99, 1.00)	1.00 (1.00, 1.01)
Off-site alcohol outlets, 1 mile	1.02 (0.99, 1.05)	1.00 (0.99, 1.01)	1.01 (1.00, 1.02)	0.99 (0.98, 1.00)†

******* $p < 0.0001$; ****** $p<0.001$; ***** $p<0.01$; † $p<0.05$; [a] Monthly income, tertiles [b] NPS = Neighborhood Perception Score (range: 3 – 14)
Abbreviations: COR = crude odds ratio, CI = confidence interval

Table 9. Multivariate logistic regression of hypothesized risk factors with 30-day cocaine/crack use, alcohol use, concurrent cocaine/crack and alcohol use and use of neither among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variable	**Cocaine/crack Only (n=52)**	**Alcohol-only (n=838)**	**Concurrent (n=503)**	**Neither (n=470)**
	AOR (95% CI)	*AOR (95% CI)*	*AOR (95% CI)*	*AOR (95% CI)*
Male	1.57 (0.89, 2.78)	0.74 (0.61, 0.89)*	0.95 (0.75, 1.19)	1.47 (1.17, 1.84)**
Age	1.03 (1.01, 1.05)†	0.98 (0.97, 0.99)***	1.07 (1.06, 1.08)***	0.96 (0.95, 0.97)***
Education				
< High School	1.07 (0.48, 2.40)	0.73 (0.57, 0.95)†	1.42 (1.05, 1.92)†	1.10 (0.80, 1.50)
High School/GED	1.57 (0.73, 3.36)	0.73 (0.56, 0.93)†	1.13 (0.84, 1.53)	1.33 (1.98, 1.80)
> High School	*(referent)*	*(referent)*	*(referent)*	*(referent)*
Income[a]				
$0 - $350	1.41 (0.68, 2.94)	0.75 (0.59, 0.96)†	1.58 (1.18, 2.13)*	0.89 (0.67, 1.19)
$351- $850	1.27 (0.61, 2.61)	0.74 (0.59, 0.94)†	1.62 (1.22, 2.15)**	0.92 (0.70, 1.22)
> $850	*(referent)*	*(referent)*	*(referent)*	*(referent)*
Employed	0.92 (0.46, 1.88)	1.19 (0.95, 1.49)	0.83 (0.63, 1.09)	0.95 (0.73, 1.25)
NPS[b]	1.03 (0.84, 1.25)	0.98 (0.92, 1.04)	1.18 (1.09, 1.28)***	0.90 (0.83, 0.96)*
On-site alcohol outlets, 1 mile	0.97 (0.95, 0.99)*	1.00 (1.00, 1.01)	0.99 (0.98, 0.997)*	1.01 (1.01, 1.02)**
Off-site alcohol outlets, 1 mile	1.09 (1.03, 1.15)*	1.00 (0.99, 1.01)	1.02 (1.00, 1.04)†	0.96 (0.94, 0.98)**

******* $p < 0.0001$; ****** $p<0.001$; ***** $p<0.01$; † $p<0.05$; [a] Monthly income, tertiles [b] NPS = Neighborhood Perception Score (range: 3 – 14)
Abbreviations: AOR = adjusted odds ratio, CI = confidence interval

APPENDICES

I. Supplemental Tables

II. Figures

III. Literature Review Tables

APPENDIX I: SUPPLEMENTAL TABLES

Table 9. Bivariate logistic regression of select demographic variables with 30-day cocaine/crack use, alcohol use, concurrent cocaine/crack and alcohol use and use of neither among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variable	**Cocaine/crack Only (n=52)**	**Alcohol-only (n=838)**	**Concurrent (n=503)**	**Neither (n=470)**
	COR, 95% CI	*COR, 95% CI*	*COR, 95% CI*	*COR, 95% CI*
Sex	1.40 (0.81, 2.43)	0.80 (0.67, 0.96)†	0.81 (0.66, 1.00)†	1.55 (1.26, 1.91)***
Age	1.34 (1.06, 1.70)	0.81 (0.75, 0.88)***	2.00 (1.81, 2.20)***	0.62 (0.56, 0.69)***
Education[a]	1.02 (0.71, 1.46)	1.13 (1.00, 1.27)†	0.95 (0.83, 1.09)	0.90 (0.79, 1.03)
Employment	0.75 (0.38, 1.47)	1.39 (1.13, 1.71)*	0.66 (0.52, 0.85)*	1.00 (0.80, 1.28)
Income[b]	0.89 (0.69, 1.15)	1.13 (1.04, 1.23)*	0.87 (0.79, 0.95)*	1.00 (0.91, 1.10)

******* $p < 0.0001$; ****** $p<0.001$; ***** $p<0.01$; † $p<0.05$; [a] Education categorized into groups: less than high school, high school or GED equivalent, and greater than high school **[b]** Monthly income, tertiles

Abbreviations: COR = crude odds ratio; CI = confidence interval

Table 10. Bivariate logistic regression of neighborhood drug/alcohol perceptions with 30-day cocaine/crack use, alcohol use, concurrent cocaine/crack and alcohol use and use of neither among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variable	**Cocaine/crack Only (n=52)**	**Alcohol-only (n=838)**	**Concurrent (n=503)**	**Neither (n=470)**
	COR (95% CI)	*COR (95% CI)*	*COR (95% CI)*	*COR (95% CI)*
Drug use and drug sales are a problem in my neighborhood	0.73 (0.55, 0.97) †	1.11 (1.02, 1.21) †	0.79 (0.71, 0.87)***	1.16 (1.05, 1.28)*
Too much drug use in my neighborhood	1.32 (0.98, 1.76)	0.93 (0.85, 1.00)	1.28 (1.16, 1.41)***	0.85 (0.77, 0.93)**
Too much alcohol use in my neighborhood	1.10 (0.84, 1.43)	0.94 (0.86, 1.02)	1.27 (1.15, 1.41)	0.85 (0.78, 0.94)**

******* $p < 0.0001$; ****** $p<0.001$; ***** $p<0.01$; † $p<0.05$;

Table 11. Bivariate analysis of alcohol outlet proximity and 30 day use of cocaine/crack and alcohol

Variable	**Cocaine/crack Only (n=52)**	**Alcohol-only (n=838)**	**Concurrent (n=503)**	**Neither (n=470)**
	COR (95% CI)	*COR (95% CI)*	*COR (95% CI)*	*COR (95% CI)*
All within 0.25 miles	1.14 (0.99, 1.30)	1.00 (0.95, 1.05)	1.04 (0.98, 1.10)	0.95 (0.89, 1.00)
On-site outlets within 0.25 miles	1.05 (0.77, 1.43)	0.99 (0.89, 1.11)	1.05 (0.93, 1.18)	0.95 (0.84, 1.09)
Off-site outlets within 0.25 miles	1.21 (1.02, 1.43)†	1.00 (0.93, 1.06)	1.04 0.97, 1.12)	0.93 (0.86, 1.01)
All within 0.50 miles	1.02 (0.97,1.07)	1.00 (0.98, 1.02)	1.01 (0.99, 1.03)	0.99 (0.97, 1.01)
On-site outlets within 0.50 miles	0.97 (0.88, 1.06)	1.00 (0.97, 1.02)	1.01 (0.98, 1.04)	1.00 (0.97, 1.03)
Off-site outlets within 0.50 miles	1.15 (1.03, 1.27)	1.00 (0.96, 1.03)	1.02 (0.98, 1.06)	0.97 (0.93, 1.01)
All within 1.00 miles	1.00 (0.99, 1.01)	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)	1.00 (1.00, 1.01)
On-site within 1.00 miles	1.00 (0.99, 1.01)	1.00 (1.00, 1.00)	1.00 (0.99, 1.00)	1.00 (1.00, 1.01)
Off-site outlets within 1.00 miles	1.02 (0.99, 1.05)	1.00 (0.99, 1.01)	1.01 (1.00, 1.02)	0.99 (0.98, 1.00) †

******* $p < 0.0001$; ****** $p<0.001$; ***** $p<0.01$; † $p<0.05$;

Table 12. Two-way comparison of reported 30-day crack cocaine and powder cocaine users among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variable	**Total Sample (*n* = 1,843) Missing = 21**		**Significance**
Powder Cocaine Use	Crack Cocaine Use		$X^2/F(df)$
	No	Yes	
No	1,291	320	$X^2(1) = 94.7$
Yes	113	110	$p < 0.0001$

Table 13. Two-way comparison of 30-day and 90-day reported cocaine/crack use among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variable	**Total Sample (*n* = 1,846) Missing = 18**		**Significance**
	30-day Cocaine/crack use		$X^2(df)$
90-Day Cocaine/crack use	No	Yes	*p-value*
No	1,254	0	$X^2(1) = 122.7$
Yes	37	554	$p < 0.0001$

Table 14. Two-way comparison of 30-day and 90-day reported alcohol use among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variable	**Total Sample (*n* = 1,863) Missing = 1**		**Significance**
	30-Day Alcohol Use		$X^2(df)$
90-Day Alcohol Use	No	Yes	*p-value*
No	406	0	$X^2(1) = 1{,}333.6$
Yes	116	1,341	$p < 0.0001$

Table 15. Two-way comparison of 30-day and 90-day reported concurrent cocaine/crack and alcohol use among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variable	**Total Sample (*n* = 1,846) Missing = 18**		**Significance**
	30-Day Concurrent Use		$X^2(df)$
90-Day Concurrent Use	No	Yes	*p-value*
No	1,299	0	$X^2 = 1{,}645.2$
Yes	43	503	$p < 0.0001$

Table 16. Two-way comparison of reported alcohol use between 30-day cocaine/crack vs. powder cocaine drug users among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variable	**Total Sample (*n* = 1,864)**	
	Crack Users	Powder Cocaine Users
30-Day Alcohol Use (mean, s.d.)	17.7 (11.4)	18.7 (12.0)
90-Day Alcohol Use (mean, s.d.)	52.0 (34.2)	54.8 (34.8)

Table 17. Comparison of alcohol outlet proximity between 30-day cocaine/crack vs. powder cocaine drug users among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variable	**Total Sample (*n* = 1,864)**	
	Crack Users	Powder Cocaine Users
Alcohol Outlet Prox.	*mean (s.d.)*	*mean (s.d.)*
All / 0.25	1.8 (1.7)	1.7 (1.7)
On-site / 0.25	0.5 (0.9)	0.4 (0.7)
Off-site / 0.25	1.4 (1.3)	1.4 (1.4)
All / 0.50	6.8 (5.3)	6.6 (4.8)
On-site / 0.50	2.3 (3.8)	1.8 (2.9)
Off-site / 0.50	4.5 (2.6)	4.8 (2.8)
All /1.0	34.1 (33.4)	28.0 (23.3)
On-site / 1.0	15.8 (25.7)	10.5 (16.9)
Off-site / 1.0	18.4 (9.2)	17.6 (7.9)

Table 18. Goodness of fit and regression diagnostics of multivariate logistic regression analysis of substance user groups among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variable	**Cocaine/crack Use (n=52)**	**Alcohol Use (n=838)**	**Concurrent Use (n=503)**	**Neither (n=470)**
	X^2 (p-value)	*X^2 (p-value)*	*X^2 (p-value)*	*X^2 (p-value)*
Hosmer-Lemeshow	8.14 (p=0.42)	10.58 (p = 0.23)	39.35 (p<0.0001)	24.72 (p =0.002)
AUC	0.67	0.62	0.75	0.69

Screening of Variables

Table 18. Screening of select variables: missing data and out of range values from *People and Places* dataset

Variable	**Continuous/ Categorical**	**Missing *n (%)***	**Out of range/ Implausible**
Demographics			
Sex	Categorical	0 (0.0)	
Age	Continuous	0 (0.0)	None
Education	Categorical	0 (0.0)	
Employment Status	Categorical	35 (1.9)	
Income	Continuous	2 (0.11)	None
Cocaine/crack Use			
Cocaine/crack, 30 (Y/N)	Categorical	18 (1.0)	
Cocaine/crack use, 90 (Y/N)	Categorical	18 (1.0)	
Exclusive use (without alcohol), 30	Categorical	0 (0.0)	
Exclusive use (without alcohol), 90	Categorical	0 (0.0)	
Crack Use			
Crack use, 30 (Y/N)	Categorical	12 (0.6)	
Crack use, 90 (Y/N)	Categorical	12 (0.6)	
Days used crack, 30	Continuous	12 (0.6)	None
Days used crack, 90	Continuous	12 (0.6)	None
Exclusive use (without alcohol), 30	Categorical	12 (0.6)	
Exclusive use (without alcohol), 90	Categorical	12 (0.6)	
Cocaine Use			
Cocaine use, 30 (Y/N)	Categorical	21 (1.1)	
Cocaine use, 90 (Y/N)	Categorical	21 (1.1)	
Days used cocaine, 30	Continuous	21 (1.1)	None
Days used cocaine, 90	Continuous	21 (1.1)	None
Exclusive use (without alcohol), 30	Categorical	21 (1.1)	
Exclusive use (without alcohol), 90	Categorical	21 (1.1)	
Alcohol Use			
Drank past 30 days (Y/N)	Categorical	1 (0.1)	
Drank past 90 days (Y/N)	Categorical	0 (0.0)	
Days drank, 30	Continuous	1 (0.1)	None
Days drank, 90	Continuous	0 (0.0)	None
Exclusive use (without cocaine/crack), 30	Categorical	1 (0.1)	
Exclusive use (without cocaine/crack), 90	Categorical	0 (0.0)	

Table 19. (continued) Screening of select variables: missing data and out of range values from *People and Places* dataset

Variable	**Continuous/ Categorical**	**Missing *n (%)***	**Out of range/ Implausible**
Concurrent Use			
Cocaine/crack and alcohol, 30 (Y/N)	Categorical	19 (1.0)	
Cocaine/crack and alcohol, 90 (Y/N)	Categorical	18 (1.0)	
Crack and alcohol, 30 (Y/N)	Categorical	22 (1.2)	
Crack and alcohol, 90 (Y/N)	Categorical	21 (1.1)	
Cocaine and alcohol, 30 (Y/N)	Categorical	24 (1.3)	
Cocaine and alcohol, 90 (Y/N)	Categorical	23 (1.2)	
User			
Crack/Alcohol/Only/Neither, 30	Categorical	12 (0.6)	
Crack/Alcohol/Only/Neither, 90	Categorical	11 (0.6)	
Cocaine/crack/Alcohol/Only/Neither, 30	Categorical	0 (0.0)	
Cocaine/crack/Alcohol/Only/Neither, 90	Categorical	0 (0.0)	
Neighborhood Perceptions			
Drug problem in neighborhood	Categorical	2 (0.1)	
Too much drug use in neighborhood hood	Categorical	3 (0.2)	
Too much alcohol in neighborhood	Categorical	1 (0.1)	
Alcohol Outlet Prox.			
All / 0.25	Continuous	0 (0.0)	None
On-site / 0.25	Continuous	0 (0.0)	None
Off-site / 0.25	Continuous	0 (0.0)	None
All / 0.50	Continuous	0 (0.0)	None
On-site / 0.50	Continuous	0 (0.0)	None
Off-site / 0.50	Continuous	0 (0.0)	None
All /1.0	Continuous	0 (0.0)	None
On-site / 1.0	Continuous	0 (0.0)	None
Off-site / 1.0	Continuous	0 (0.0)	None

Table 20. Bivariate analysis of missing data for employment status with demographics and concurrent substance use variables from *People and Places* dataset

	Employment Status (*n* = 35, 1.9%)	
Variables	*Estimate (p-value)*	**Associated?**
Sex	-0.0403 (p = 0.91)	No
Age	0.0189 (p = 0.14)	No
Education	-0.00984 (p = 0.96)	No
Employment Status	N/A	N/A
Income	0.1204 (p = 0.44)	No
Concurrent Use		
Cocaine/crack and alcohol, 30	0.7089 (p = 0.04)	**Yes**
Cocaine/crack and alcohol, 90	0.8281 (p =0.02)	**Yes**
Crack and alcohol, 30	0.3470 (p = 0.42)	No
Crack and alcohol, 90	0.6930 (p = 0.08)	No
Cocaine and alcohol, 30	0.8761 (p = 0.11)	No
Cocaine and alcohol, 90	0.7023 (p = 0.19)	No

Table 21. Bivariate analysis of missing data for income with demographics and concurrent substance use variables from *People and Places* dataset

	Income (*n* = 2, 0.11%)	
Variables	*Estimate (p-value)*	**Associated?**
Sex	0.2483 ($p = 0.86$)	No
Age	-0.2397 ($p = 0.23$)	No
Education	-9.8404 ($p = 0.92$)	No
Employment Status	-0.5188 ($p = 0.46$)	No
Income	N/A	N/A
Concurrent Use		
Cocaine/crack and alcohol, 30	-10.3204 ($p = 0.96$)	No
Cocaine/crack and alcohol, 90	-10.3528 ($p = 0.96$)	No
Crack and alcohol, 30	-10.1713 ($p = 0.97$)	No
Crack and alcohol, 90	-10.1699 ($p = 0.97$)	No
Cocaine and alcohol, 30	-10.0571 ($p = 0.98$)	No
Cocaine and alcohol, 90	-10.0669 ($p = 0.98$)	No

Table 22. Bivariate analysis of missing data for 30-day cocaine/crack use variable with demographic variables from *People and Places* dataset

Binary 30-day Cocaine/crack Use (*n* = 18, 1.0%)		
Demographics	**Estimate, (p-value)**	**Associated?**
Sex	-1.3721 (p = 0.03)	**Yes**
Age	0.0226 (p = 0.21)	No
Education	0.2800 (p = 0.36)	No
Employment Status	0.1093 (p = 0.70)	No
Income	-0.1006 (p = 0.64)	No

Table 23. Bivariate analysis of missing data for 90-day cocaine/crack use variable with demographic variables from *People and Places* dataset

Binary 90-day Cocaine/crack Use (*n* = 18, 1.0%)		
Demographics	**Estimate, (p-value)**	**Associated?**
Sex	-1.3721 (p = 0.03)	**Yes**
Age	0.0226 (p = 0.21)	No
Education	0.2800 (p = 0.36)	No
Employment Status	0.1093 (p = 0.70)	No
Income	-0.1006 (p = 0.64)	No

Table 24. Select demographic characteristics by 90-day drug/alcohol use among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

Variables	**Crack-only User (*n* =30)**		**Alcohol-only User (*n* =912)**		**Concurrent User (*n* =285)**		**Neither (*n* =626)**		**Significance**
	n	*(%)*	*n*	*(%)*	*n*	*(%)*	*n*	*(%)*	*x^2(df), p-value*
Sex									
Men	12	(40.0)	525	(57.6)	154	(54.0)	346	(55.3)	$x^2(3) = 4.6$,
Women	18	(60.0)	387	(42.4)	131	(46.0)	280	(44.7)	p=0.20
Age (years)									
18 – 29	0	(0.0)	407	(44.6)	5	(1.8)	268	(42.8)	$x^2(9) = 266.16$,
30 – 39	6	(20.0)	165	(18.1)	33	(11.6)	112	(17.9)	p<0.0001
40 – 49	14	(46.7)	187	(20.5)	127	(44.6)	124	(19.8)	
50 +	10	(16.8)	153	(16.8)	120	(42.1)	122	(19.5)	
Education									
< HS	9	(30.0)	350	(38.4)	119	(41.8)	244	(39.0)	$x^2(6) = 7.87$,
HS/GED	14	(46.7)	340	(37.3)	104	(36.5)	260	(41.5)	p=0.24
> HS	7	(23.3)	222	(24.3)	62	(23.3)	122	(19.5)	
Income									
$0 - $249	8	(26.7)	208	(22.9)	78	(27.4)	155	(24.8)	$x^2(9) = 31.43$,
$250 - $599	10	(33.3)	207	(22.8)	89	(31.2)	162	(25.9)	p=0.0002
$600 - $1012	8	(26.7)	223	(24.5)	74	(26.0)	165	(26.4)	
$1,013 +	4	(29.9)	272	(29.9)	44	(15.4)	144	(23.0)	
Employment									
Unemployed	23	(76.7)	629	(70.2)	218	(79.0)	473	(76.7)	
Employed	7	(23.3)	267	(29.8)	58	(21.0)	114	(23.3)	

Table 25. Neighborhood drug/alcohol perceptions by 90-day drug/alcohol behavior among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

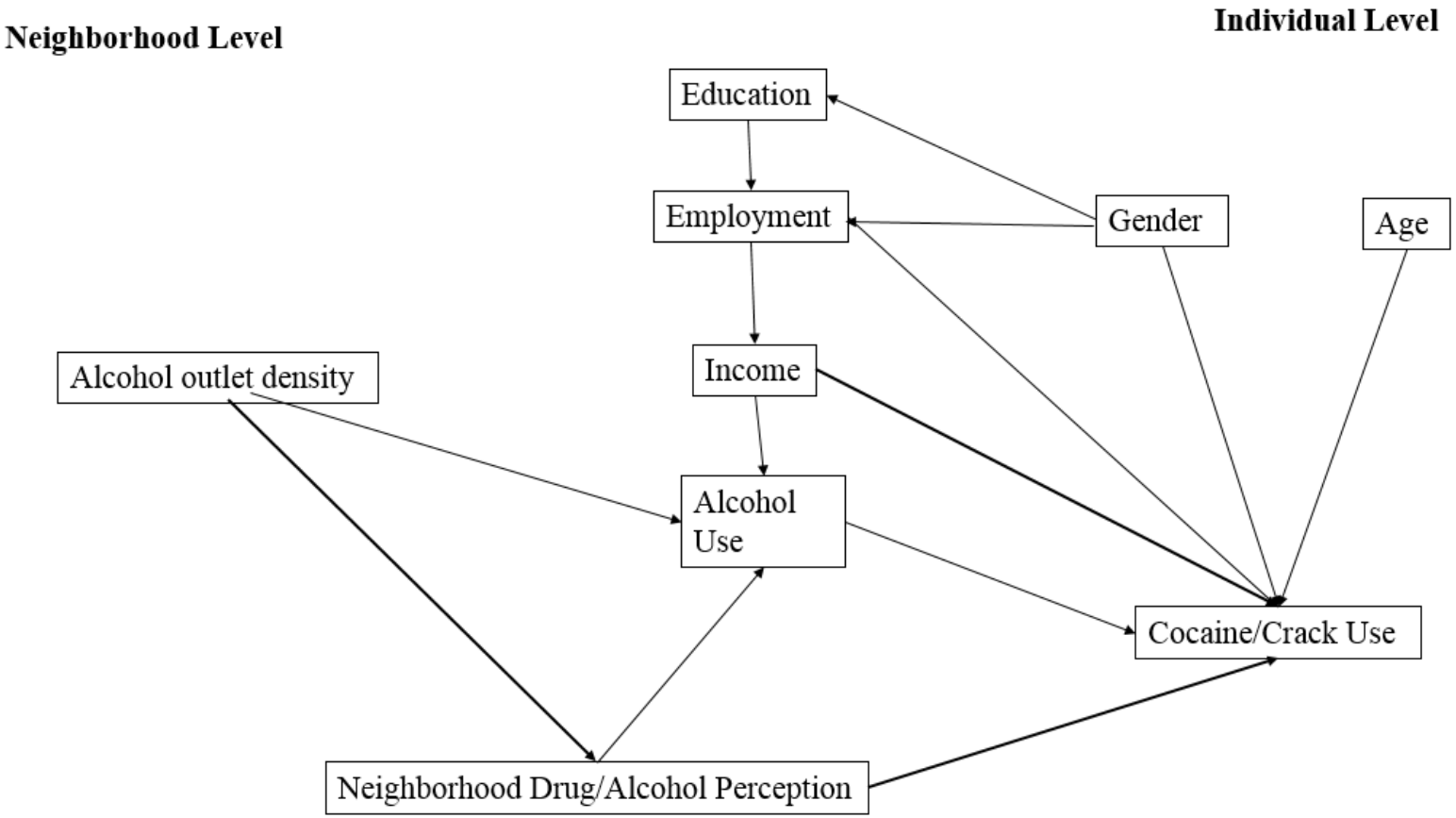
Variables	**Crack-only User (*n* = 38)**	**Alcohol-only User (*n* = 939)**	**Concurrent User (*n* = 428)**	**Neither (*n* = 108)**	**Significance**
	n (%)	*n (%)*	*n (%)*	*n (%)*	*x^2(df), p-value*
"Drug use and drug sales are a problem in my neighborhood"					
Very true	15(15.5)	290 (28.2)	125 (29.2)	107 (28.7)	$x^2(3)$ =
True	12(36.4)	369 (35.9)	195 (45.6)	110 (29.5)	18.68,
Somewhat true	3(9.1)	173 (16.8)	55 (12.9)	59 (15.8)	p=0.0003
Not true	3 (9.1)	195 (19.0)	53 (12.4)	97 (26.0)	
Don't know	0 (0.0)	2 (0.2)	0 (0.0)	0 (0.0)	
"Too much drug use in my neighborhood"					
Strong disagree	0 (0.0)	23 (2.2)	6 (1.4)	24 (6.4)	$x^2(3)$ =
Disagree	3 (9.1)	177 (17.2)	49 (11.5)	79 (21.2)	21.68,
Neither	1 (3.0)	70 (6.8)	18 (4.2)	22 (5.9)	p<0.0001
Agree	16 48.5)	498 (48.4)	238 (55.6)	158 (42.4)	
Strongly Agree	13(39.4)	260 (25.3)	117 (27.3)	88 (23.6)	
Don't know	0 (0.0)	1 (0.1)	0 (0.0)	0 (0.0)	
"Too much alcohol use in my neighborhood"					
Strong disagree	0 (0.0)	19 (1.9)	4 (0.9)	19 (5.1)	$x^2(3)$ =
Disagree	5 15.2)	183 (17.8)	52 (12.2)	82 (22.0)	15.10,
Neither	0 (0.0)	78 (7.6)	23 (5.4)	29(22.3)	p=0.0017
Agree	18(54.6)	499 (48.5)	237 (55.4)	148 (39.7)	
Strongly Agree	10(30.3)	249 (24.2)	112 (26.2)	95 (25.5)	
Don't know	0 (0.0)	1 (0.1)	0 (0.0)	0 (0.0)	

Table 26. Alcohol outlet proximity stratified by 90-day use of cocaine/crack and alcohol among African American adults in disadvantaged neighborhoods of Atlanta, Georgia, May 2009 – March 2012

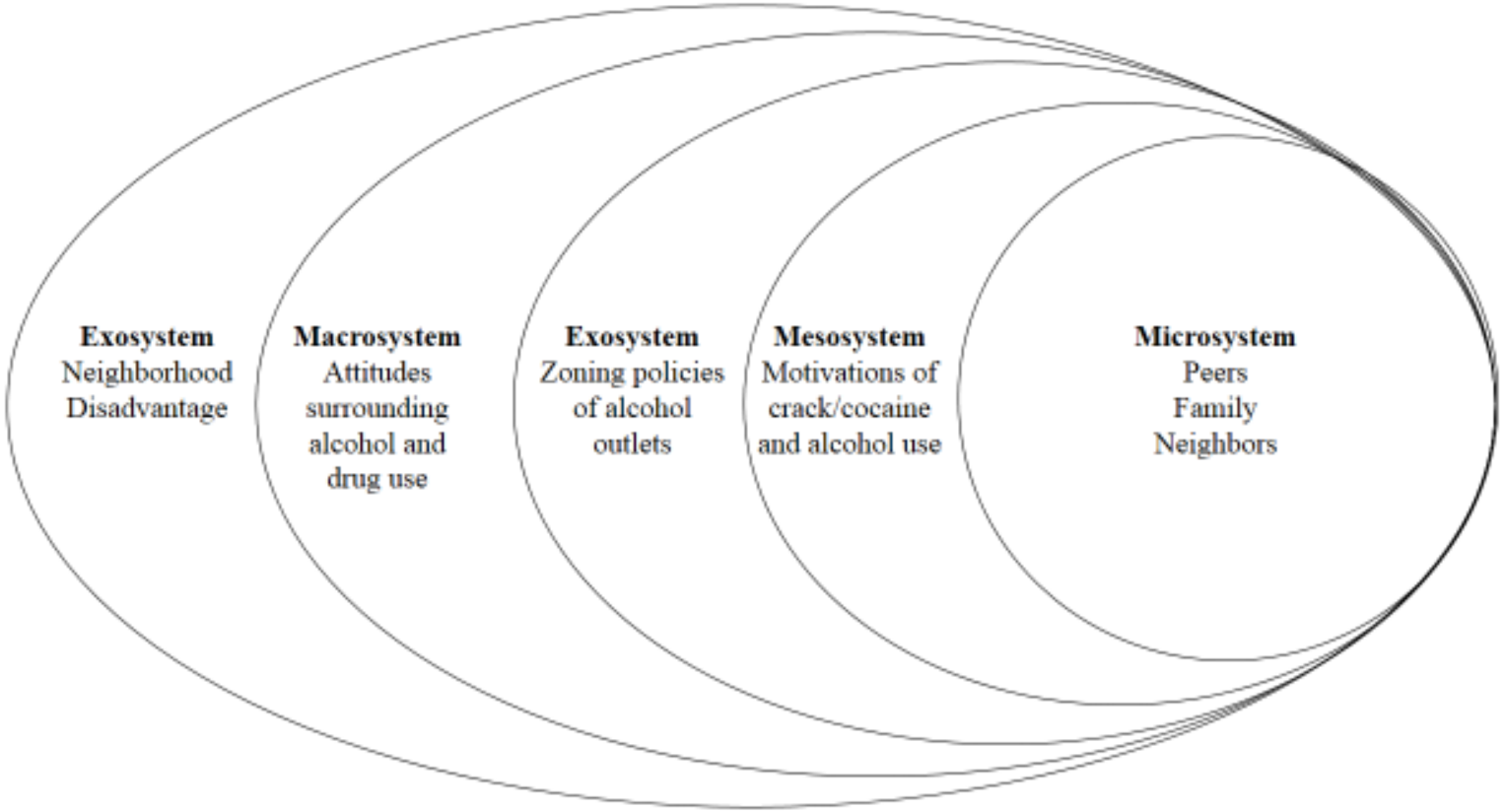
Variables	**Crack-only User (*n* = 33)**		**Alcohol-only User (*n* = 1,029)**		**Concurrent User (n = 428)**		**Neither (*n* = 373)**		**Significance**
Outlet Type/ Distance (mi.)	*Mean*	*(s.d.)*	*Mean*	*(s.d.)*	*Mean*	*(s.d.)*	*Mean*	*(s.d.)*	*ANOVA*
All / 0.25	2.33	(2.1)	1.66	(1.8)	1.83	(1.7)	1.62	(1.70	F(3)=2.45, p=0.06
On-site / 0.25	0.42	(1.1)	0.36	(0.8)	0.45	(0.9)	0.39	(0.9)	F(3)=0.73, p=0.54
Off-site / 0.25	1.91	(1.6)	1.29	(1.4)	1.37	(1.3)	1.23	(1.4)	**F(3)=2.85, p=0.04**
All / 0.50	7.03	(4.9)	6.33	(5.2)	6.87	(5.1)	6.61	(4.9)	F(3)=0.70, p=0.55
On-site / 0.50	1.79	(3.2)	1.88	(3.5)	2.18	(3.6)	2.09	(3.3)	F(3)=0.68, p=0.57
Off-site / 0.50	5.24	(2.9)	4.45	(2.6)	4.67	(2.6)	4.52	(2.5)	F(3)=1.16, p=0.33
All /1.0	35.55	(27.8)	31.41	(35.8)	33.07	(30.9)	33.22	(35.7)	F(3)=0.36, p=0.78
On-site / 1.0	15.24	(21.8)	14.15	(27.4)	14.76	(23.6)	16.25	(28.0)	F(3)=0.12, p=0.94
Off-site / 1.0	20.30	(7.5)	17.33	(9.8)	18.36	(8.8)	17.01	(9.2)	F(3)=1.51, p=0.21

APPENDIX II: FIGURES

CONCEPTUAL MODEL



Bronfenbrenner's Ecological Approach



APPENDIX III: LITERATURE REVIEW TABLES

Table 1. Neighborhood Effects

Primary Author	Year	Title	Study Type	Study Sample	Exposure	Measured Outcome	Findings
Boardman	2001	Neighborhood Disadvantage, Stress, and Drug Use among Adults	Cross-sectional	adults (N = 1,101) using the 1995 Detroit Area Study in conjunction with tract-level data from the 1990 census	neighborhood disadvantage	Drug use and psychological distress	Mean Neighborhood Disadvantage was statistically significantly higher among individuals who reported drug use. There was also a statistically significant correlation between the two (b = .079, p<0.05). The estimate net effect of neighborhood disadvantage on drug use among adults was most pronounced among individuals with low income (b=-.025, p<.05)
Crum	1996	Neighborhood environment and opportunity to use cocaine and other drugs in late childhood and early adolescence	Longitudinal	1416 urban-dwelling middle-school participants, 1992	neighborhood disadvantage	Illicit drug use	50 youths said that someone actively had offered them a chance to take cocaine or smoke crack. youths living in the most disadvantaged neighborhoods (highest tertile:) were an estimated 5.6 times more likely to have been offered cocaine, as compared to those in relatively advantaged neighborhoods (P = 0.001). There was also higher and alcohol exposure opportunity (OR = 1.9, P = 0.0005).
Duncan	2002	A Multilevel Analysis of Neighborhood Context and Youth Alcohol and Drug Problems	Cross-sectional	residential family members from 55 neighborhoods in a metropolitan city the Pacific Northwest (n=1,182)	neighborhood variables (poverty, alcohol retail outlet data)	Youth alcohol and drug problems (social cohesion, perceived drug and alcohol problems, and drug/alcohol arrest data)	At the neighborhood level, poverty was significantly and positively correlated to the number of stores selling alcohol (b= .30, p <.05). The relationship between perceived neighborhood problems and neighborhood youth drug and alcohol arrests was also significant, b= .52, p < .05.
Fothergill	2009	Pathways to Adult Marijuana and Cocaine Use: A Prospective Study of African Americans from Age 6 to 42	Longitudinal Cohort	African Americans from Woodlawn, an inner city community in Chicago (n=1,242)			For cocaine use, five variables had total effects equal to or above .10O: early adult income (-.219), adolescent substance use (.214), first grade aggression (.108), early adult church attendance (-.107), and first grade shy behavior (-.100) all p<.05.
Fuller	2005	Effects of Race, Neighborhood, and Social Network on Age at Initiation of Injection Drug Use	Cross-sectional	Injection drug users (IDUs) 15 - 30 years old who had been injecting 2 to 5 years. July 1997 and May 1999, Baltimore, MD	IDU, neighborhood factors	Socio-behavioral risk survey	African American IDUs from neighborhoods with large percentages of minority residents and low adult educational levels were more likely to initiate injection during adolescence than White IDUs from neighborhoods with low percentages of minority

							residents and high adult education levels 3.66 (2.11, 6.34).
Galea	2005	Drug use, misuse, and the urban environment	Literature review/concept proposal	NA	NA	NA	Proposes Urban characteristics which might influence drug use: Primary (residential segregation, income distribution, neighborhood deprivation, population density), Secondary (built environment, access to substances, availability of public transportation, social and health services)
Latkin	2007	Direct and Indirect Associations of Neighborhood Disorder With Drug Use and High-Risk Sexual Partners	Cohort	A cohort (N 838) recruited for an HIV prevention study of drug users (2002–2004) in Baltimore, Maryland	High-risk areas	Drug Use and sexual risk behaviors	An indirect pathway modeling [neighborhood disorder -> psychologic distress -> drug use -> sexual risk behavior] was statistically significant
Karriker-Jaffe	2013	Neighborhood socioeconomic status and substance use by U.S. adults	Cross-sectional	Nationally-representative samples of U.S. adults (N = 14,531) from the 2000 and2005 National Alcohol Surveys	Neighborhood SES	Use of "other drugs" (besides marijuana)	Odds of monthly other drug use was highest among women in disadvantaged neighborhoods 1.54 (1.05, 2.26) compared to middle-class neighborhoods
Richardson	2005	Neighborhood effects on drug reporting	Cross-sectional	A household survey of high-risk communities with above-average admissions to state-supported drug and alcohol treatment programs; Chicago, IL n=303	neighborhood racial characteristics	reporting crack cocaine use	Under reporting was more prevalent among African Americans OR=15.3 (2.7–86.0) than it was among whites and Hispanics. Respondents who reported no life time cocaine/ crack use but tested positive for cocaine also tended to be respondents in our sample who live in more segregated neighborhoods (2.0 (1.0–4.4)*).
Ross	2001	Neighborhood Disadvantage, Disorder, and Health	Cross-sectional	2,482 adults in Illinois	disadvantaged neighborhood	Health	Residents of disadvantaged neighborhoods have worse health (worse self-reported health and physicalfunctioning and more chronic conditions) than residents of more advantaged neighborhoods. The association is mediated entirely by perceived neighborhood disorder and the resulting fear
Schroeder	2001	Illicit Drug Use in One's Social Network and in One's Neighborhood Predicts Individual Heroin and Cocaine Use	longitudinal	342 inner-city adults with a history of injection drug use were followed for 1 year	Social network and neighborhood factors	Reported crack cocaine and heroin use	High level of drug-related arrests in the participant's neighborhood was associated with reported drug use (OR 2.41, 95% CI 1.24 to 4.71), as well as High Poverty OR=1.92 (1.20, 3.10) and More than half of adults not completing high school OR=1.88 (1.17, 3.01).

Sterk	2014	Neighbourhood structural characteristics and crack cocaine use: Exploring the impact of perceived neighbourhood disorder on use among African Americans	Cross-sectional	crack cocaine users from 70 disadvantaged urban neighborhoods across Atlanta (n=461)	perceived neighborhood disadvantage and social context of use	frequency of crack cocaine use	Perceived neighbourhood disorder is associated with frequency of crack cocaine use independently of socio-demographics (IRR=1.06, p<.05). However, its significance was eliminated when controlling for use-related practices and the social context of use. Such practices and the social context of use may mediate the relationship between neighbourhood disorder and crack cocaine use . Having traded sex (IRR=1.16.05).
Winstanly	2001	The association of self-reported neighborhood disorganization and social capital with adolescent alcohol and drug use, dependence, and access to treatment	Cross-sectional	Youth between the ages of 12 and 17 (n=38,115) respondents.	Neighborhood perception, social capital	AOD use	After controlling for individual- and family-level characteristics, neighborhood disorganization and social capital were associated with AOD use and dependence.

Table 2. Social Capital

Primary Author	Year	Title	Study Type	Study Sample	Exposure	Measured Outcome	Findings
Bernstein	2007	The built environment and alcohol consumption in urban neighborhoods	Cross-Sectional	n=1355 respondents from 59 NYC neighborhoods	Neighborhood Built Environment	Recent Alcohol Use	Persons living in neighborhoods characterized by poorer features of the built environment were up to 150% more likely to report heavy drinking in the last 30 days compared to persons living in neighborhoods characterized by a better built environment
Cattell	2001	Poor people, poor places, and poor health: the mediating role of social networks and social capital	Qualitative, Cross-Sectional	Neighborhood residents (n=35) and workers (n=15)	neighborhood characteristics and perceptions; poverty and social exclusion, and social consciousness	health and well being	Link between social capital and well-being
Elleway	2010	The socio-spatial distribution of alcohol outlets in Glasgow City	Cross-Sectional	2221 alcohol outlets in Glasgow, Scottland	NA	Alcohol Outlet Density, Poverty	Some deprived areas contain the highest concentration while others with a similar deprivation score contain very few.
Gorman	1997	The Concentration of Liquor Outlets in an Economically Disadvantaged City in the Northeastern United States	Cross-Sectional	21 neighborhoods of Newark, NJ	Liquor Outlet Distribution	Poverty/Ethnicity	Four neighborhoods, which occupy one-quarter of the residential land mass of the city and which are home to one-quarter of its population, were found to contain over half of its retail liquor outlets. Three of these neighborhoods are very poor and have large minority populations. The neighborhood with the highest concentration of outlets, however, has one of the lowest levels of poverty in the city and is ethnically quite diverse.
Hay	2009	Neighbourhood deprivation and access to alcohol outlets: A national study	Cross-Sectional	Data on liquor licenses active on the 6th March 2001 (census night) for all of New Zealand	Alcohol Outlet Density	Poverty	Strong associations were found between proximity to the nearest alcohol outlet and deprivation, there being greater access to outlets in more-deprived urban areas.
Romley	2007	Alcohol and Environmental Justice: The Density of Liquor Stores and Bars in Urban Neighborhoods in the United States	Cross-Sectional	9,361 urban zip codes.	Alcohol Outlet Density	race, economic status, and age	Blacks face higher densities of liquor stores than do whites. The density of liquor stores is greater among nonwhites in lower-income areas than among whites in lower- and higher-income areas and nonwhites in higher-income areas. Nonwhite youths face higher densities of liquor stores than white youths. The density of liquor stores and bars is lower in higher-income areas, especially for nonwhites.

Theall	2009	Social capital and the neighborhood alcohol environment	Cross-Sectional	Los Angeles, CA and Lousiana residents (n=2881) from 217 census tracts	Alcohol Outlet Density	Social Capital	Neighborhood alcohol outlet density was strongly associated with reduced indicators of social capital, and the relationship between collective efficacy and outlet density appears to be mediated by perceived neighborhood safety.

Table 3. Cocaine/crack and Alcohol

Primary Author	Year	Title	Study Type	Study Sample	Exposure	Measured Outcome	Findings
Brache	2012	Functions and harms associated with simultaneous polysubstance use involving alcohol and cocaine	Pilot, qualitative	Simultaneous alcohol and cocaine users in Ontario, Canada (n = 10)	Simultaneous alcohol and cocaine use	Financial, work, income, housing, transport, partner and family relationships and mental health effects	Simultaneous alcohol and cocaine users reported a variety of social and mental negative effects (Exploratory)
DAWN	2013	Drug Abuse Warning Network, 2011: National Estimates of Drug-Related Emergency Department Visits	Surveillance	National estimates of drug-related visits to hospital emergency departments (EDs) for the calendar year 2011	Drug Use	Emergency Visits	In 2011, about a quarter of all ED visits associated with drug misuse or abuse also involved alcohol. Illicit drugs were involved in over half (57.6%) of ED visits involving alcohol-drug combinations, with cocaine and marijuana representing the greater proportions of such visits (28.6% and 25.0%, respectively)
De Boni	2014	Unrecorded alcohol in Rio de Janeiro: Assessing its misusers through Respondent Driven Sampling	Cross-sectional	Adults 18-65 who reported binge-drinking in Rio de Janeiro, Brazil 2010 (n = 256)	Use of unrecorded alcohol	Demographics, HIV test, jail, AUDIT score, illicit drug use, and alcohol treatment	Use of unrecorded alcohol was associated with being older than 31 (OR 2.21; CI 95% 1.05 – 4.80), an AUDIT score>20 (OR 11.21; CI 95% 4.56 – 30.96), having used crack/cocaine (OR 2.29; CI 95% 1.02–5.21), and having received treatment for alcohol addiction in the last 12 months (OR 3.64; CI 95% 1.25 – 13.49).
Flack	2008	Among long-term crack smokers, who avoids and who succumbs to cocaine addiction?	Longitudinal	A community sample of 430 crack smokers from the Dayton, Ohio, area who were recruited in 1996–1997	crack initiation, frequency of recent use, and lifetime cocaine dependence, DSM-IV lifetime disorders	Crack cocaine dependence	The results also show that co-occurring DSM-IV disorders, alcoholism in particular, are quite common among persons who are addicted to crack (Correlation=0.39, p<.0001)
Flannery	2006	Co-Occurring Alcohol and Cocaine Dependence: Recent Findings From Clinical and Field Studies	Editorial/Summary	proceedings of a symposium held at the 2003 annual meeting of the Research Society on Alcoholism in Ft. Lauderdale, FL	NA	NA	Use for additional references
Gossup	2002	Dual dependence: assessment of dependence upon alcohol and illicit drugs, and the relationship of	Cross-sectional	735 people seeking treatment for drug misuse problems who were current (last 90 days) drinkers	alcohol use	drug and alcohol use, physical and psychological health, social situation, relationship status	High-alcohol dependence drinkers were found to be the least frequent users of illicit heroin and crack cocaine (p<0.01), but were most frequent useres of cocaine powder (p<.05) , amphetamines, and non-prescribed benzodiazepines.

		alcohol dependence among drug misusers to patterns of drinking, illicit drug use and health problems.				and problems, and treatment history	
Grant	1990	Concurrent and simultaneous use of alcohol with cocaine; Results of national survey	Cross-sectional	1985 National Survey on Drug Abuse (n=8,038)	NA	Demographics, concurrent and individual alcohol and cocaine use	96.5% of cocaine users concurrently used alcohol during the month preceding the interview
Hasin	2005	Co-occurring DSM-IV drug abuse in DSM-IV drug dependence: Results from the National Epidemiologic Survey on Alcohol and Related Conditions	Cross-sectional	42,392 respondents aged 18 years and older conducted by the NIAAA in 2001–2002, representative of US population	NA	Alcohol dependence and other drug dependence	There was a 29% graded increase of drug dependence across male age groups from respondents aged 18–29 to aged 45–64, much of which was contributed by the African-American subgroup.
Hasin	2007	Prevalence, Correlates, Disability, and Comorbidity of DSM-IV Alcohol Abuse and Dependence in the United States	Cross-sectional	representative US adult sample (N=43 093)	NA	Lifetime and 12-month DSM-IV alcohol abuse and dependence.	12-month alcohol dependence was strongly and significantly associated with all 12-month substance use and psychiatric disorders.***
Hedden	2009	Differences between adult non-drug users versus alcohol, cocaine and concurrent alcohol and cocaine problem users.	Cross-sectional	Adults 18 years and older from the 2005 National Survey on Drug Use and Health (n=36,425)	Concurrent cocaine and alcohol use, either, or none.	lifetime anxiety, lifetime depression, cigarette and marijuana use, and arrest.	Concurrent use of alcohol and cocaine was associated with higher rates of lifetime anxiety (OR=3.60, 95% CI=2.44, 5.31), lifetime depression (OR=2.29, 95% CI=1.50, 3.49), cigarette use, and arrest (both higher % than comparison groups).
Heil	2001	Alcohol Dependence among Cocaine-Dependent Outpatients: Demographics, Drug Use, Treatment Outcome and Other Characteristics	Cross-sectional	302 adults (70% men) enrolled in outpatient treatment for cocaine dependence	cocaine-dependence and alcohol-dependence	demographics, drug use, treatment outcome and other variables	With regard to cocaine use, alcoholics were more likely than non-alcoholics to report an intranasal route of administration (p=0.03), use of cocaine in social settings (p=.001), more simultaneous use of cocaine and alcohol (p<.001), and more adverse consequences of their cocaine use (p<.05).

Helzer	1988	The Co-Occurrence of Alcoholism with other Psychiatric Disorder in the General Population and Its Impact on Treatment	Cross-sectional	data from the Epidemiologic Catchment Area survey (n~ 20,000)	Alcoholism	Other Dependencies and Psychiatric disorders	Less than 1% of the total sample admitted to cocaine abuse at some point, but of these, 84% also had alcohol abuse/dependence
Higgins	1994	Alcohol Dependence and Simultaneous Cocaine and Alcohol Use in Cocaine-Dependent Patients	Cross-sectional	124 consecutive cocaine-dependent admissions to an outpatient substance abuse clinic	simultaneous cocaine and alcohol use	social settings, mental and physical health, social consequences	64% of patients reported >50% simultaneous cocaine and alcohol use. those with dependence scored higher on the alcohol and family subscales of the Addiction Severity Index, the Michigan Alcoholism Screening Test, and measures of alcohol use, and were more likely to use cocaine and alcohol simultaneously, to use cocaine with friends and in social settings, and were more likely to report financial difficulties and unwanted sexual relations as adverse consequences of their cocaine use.
Martin	2014	A comparison of motivations for use among users of crack cocaine and cocaine powder in a sample of simultaneous cocaine and alcohol users	Cross-sectional	clients in treatment for cocaine and alcohol problems who primarily smoked crack or snorted cocaine when also using alcohol (n = 153)	cocaine and alcohol - comparing those who primarily smoked crack and those who primarily used cocaine powder when using simultaneously with alcohol	Motivations examined included: 1) to cope with a negative affect, 2) enhancement, 3) to be social and 4) to conform.	Those who primarily smoked crack reported lower social motivations to use alcohol and cocaine (p=.001). Additionally, those who primarily smoked crack were more likely to be older (p=.014), report higher cocaine dependence severity(p<.001), be unemployed (p=.001) and were less likely to have completed some post-secondary education (.022), than those who primarily snorted cocaine
McCane-Katz	1998	Cocaine, alcohol mix in body to form even longer lasting, more lethal drug.	double-blind, randomized, within subjects clinical study	4 African-American men, 3 African-American women, and 1 Caucasian woman; ave age 33 years (n=8)	Four doses of intranasal cocaine hydrochloride powder (1 mg/kg every 30 min) with oral alcohol (1 g/kg) administered following the initial cocaine dose and a second alcohol drink (120	Heart rate, blood pressure, reported feelings of euphoria	Heart rate was significantly increased following each dose of study drug for cocaine–alcohol administration relative to cocaine (p 5 .002) or alcohol alone (p 5 .002). The cocaine–alcohol combination significantly increased systolic (p 5 .008) and diastolic (p 5 .003) blood pressure relative to alcohol alone.

					mg/kg) at 60 min		
Midanik	2007	Concurrent and simultaneous drug and alcohol use: Results of the 2000 National Alcohol Survey	Cross-sectional	Current drinkers from the 2000 National Alcohol Survey (n = 7,612)	NA	Prevalence of concurrent and simultaneous cocaine/crack use and alcohol use among men, women, and total.	Concurrent cocaine/crack use (0.7) was higher than simultaneous use (0.5) among women. Simultaneous use was more prevalent (1.3) among men than concurrent use (0.8). Prevalence of use was higher among men.
Pakula	2009	Simultaneous use of alcohol and cocaine: A qualitative investigation	Pilot, qualitative	Simultaneous cocaine and alcohol users at a treatment center in Ontario, Canada (n=10)	Simultaneous alcohol and cocaine use	Method of use, temoporailty, and patterns of simultaneous use.	Simultaneous alcohol use may differ by mode of cocaine use, being more often used when snorted than injected or smoked.
Pennings	2002	Effects of concurrent alcohol and cocaine use	Literature Review	Medline, the Science Citation Index/Web of Science and Toxline.	NA	NA	There is generally no evidence that the combination of the two drugs does more than enhance additively the already strong tendency of each drug to induce a variety of physical and psychological disorders. Cocaine antagonizes the learning deficits. psychomotor performance deficits and driving deficits induced by alcohol, The combination of alcohol and cocaine tends to have greater than- additive effects on heart rate, concomitant with up to 30% increased blood cocaine levels. More importantly, retrospective data suggest that the combination can potentiate the tendency towards violent thoughts and threats, which may lead to an increase of violent behaviors.
Rounsaville	1991	Psychiatric Diagnoses of Treatment-Seeking Cocaine Abusers	Cross-sectional	298 cocaine abusers seeking inpatient or outpatient treatment	cocaine abuse	psychiatric disorder	61.7% of cocaine addicts also had been diagnosed with alcoholism

Rubio	2008	Use of Cocaine by Heavy Drinkers Increases Vulnerability to Developing Alcohol Dependence: a 4-Year Follow-Up Study	Prospective Cohort	n=471 nondependent heavy drikers	heavy, nondependent drinking and cocaine use (HD + Co)	alcohol dependence	At the 4-year follow-up, 67.9% of the HD+Co group met criteria for alcohol dependence compared to 13.6% of the HD group (OR=12.3 for males and OR=7.0 females, both p<.05). The amount of cocaine used during follow-up was associated with a more rapid progression to alcohol dependence.
SAMHSA	2009	NSDUH REPORT: Concurrent Illicit Drug and Alcohol Use	Cross-sectional	Current alcohol users 12+ years old - based on combined 2006 and 2007 NSDUH data	NA	NA	Illicit drug use concurrent with the respondent's last alcohol use was reported by 5.6% of alcohol users 12+ years. Cocaine was the second most frequently used illicit drug used with alcohol.
Stinson	2005	Comorbidity between DSM-IV alcohol and specific drug use disorders in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions	Cross-sectional	2001–2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC: n = 43,093).	NA	Prevalence of alcohol and other drug dependence	The strongest associations with alcohol use disorders were observed for cocaine (OR = 19.2, 95% CI:10.71–34.56)
Wallace	1990	Crack Cocaine Smokers as Adult Children of Alcoholics: The Dysfunctional Family Link	cross-sectional	crack-cocaine dependent patients treated on an inpatient detoxification unit (n=61)	crack-cocaine dependence	adult child of an alcoholic status	61% of subjects were adult children of alcoholics, and 97% of them were adult children of a dysfunctional family, 25% domestic violence, and physical abuse (28%).
Wiseman	1996	Combined use of cocaine with alcohol or cigarettes	Cross-sectional	Cocaine users from VA inpatient rehabilitation program (n=42)	Cocaine use	Concurrent cocaine and alcohol and/or cigarette use	Concurrent use of alcohol and cocaine was reported by 37 patients (88%)

Table 4. Cocaine and Health Risks/Social Problems

Primary Author	Year	Title	Study Type	Study Sample	Exposure	Measured Outcome	Findings
Campsmith	2000	Association Between Crack Cocaine Use and High-Risk Sexual Behaviors after HIV Diagnosis	Cross-sectional	n=10, 415 Jan 1995 through Dec 1998 with HIV infected adults in 12 states	HIV diagnosis	Crack use, and high-risk sexual behaviors	Crack use after HIV diagnosis was associated with high-risk sexual behaviors such as unprotected sex, sex with multiple partners, and exchanged sex for drugs/money
Carlin	2014	Multiple Gastrointestinal Complications of Crack Cocaine Abuse	Case study	53 year old African American Male	chronic crack cocaine use	gastrointestinal complications of hemorrhage and pancreatitis	both hematemesis with multiple large ischemic gastric ulcers and acute pancreatitis
Chirgwin	1991	HIV Infection, Genital Ulcer Disease, and Crack Cocaine Use among Patients Attending a Clinic for Sexually Transmitted Diseases	Cross-sectional	194 who consented to HIV testing at an STD clinic in central Brooklyn	HIV diagnosis	Genetic Ulcer Disease and crack cocaine use	Crack cocaine use was associated with GUD (OR=15.15) and HIV antibodies (OR=2.98)
Cornish	1996	Crack Cocaine Abuse: An Epidemic with Many Public Health Consequences	Literature Review				Cardiovascular, neurologic, psychiatric, pulmonary, gastrointestinal, musculoskeletal and dermatologic manifestations
DeBeck	2009	Smoking of crack cocaine as a risk factor for HIV infection among people who use injection drugs	Longitudinal	people participating in the Vancouver Injection Drug Users Study who reported injecting illicit drugs at least once in the month before enrolment, lived in the greater Vancouver area, were HIVnegative at enrolment and completed at least 1 follow-up study visit (n=1048)	injection drug use	HIV infection	The risk of HIV sero-conversion among participants who were daily smokers of crack cocaine increased over time (period 1: hazard ratio [HR] 1.03, 95% confidence interval [CI] 0.57–1.85; period 2: HR 1.68, 95% CI 1.01–2.80; and period 3: HR 2.74, 95% CI 1.06–7.11).
Edlin	1994	Intersecting Epidemics - Crack Cocaine Use and HIV Infection Among Inner-City Young Adults	Cross-sectional	young adults age 18-29 who smoked crack ruglarly or who had never smoked crack (n=1967) from inner-city neighborhoods of New York, Miami, and San Francisco	Smoking Crack Cocaine	HIV infection	In poor, inner-city communities, young smokers of cocaine, particularly women who have sex in exchange for money or drugs, are at high risk for HIV infection.

Harzke	2008	Binge Use of Crack Cocaine and Sexual Risk Behaviors Among African-American, HIV-Positive Users	Cross-sectional	303 African-American, HIV-positive users	binge use of crack cocaine	High risk sex	Recent bingers had more sex partners in the last six months and 30 days and were more likely to have never used a condom in the last 30 days. Among male users, recent bingers were more likely to report lifetime and recent exchange of money for sex and drugs for sex. Among both male and female users, recent bingers were more likely to report lifetime trading of sex for drugs. African-American, HIV-positive binge users of crack cocaine appear to be at increased risk for HIV transmission
Johnson	2008	Late-Onset Crack Users: An Emergent HIV Risk Group	Cross-sectional	African-American, male, late-onset crack users who started using crack at the age of 50 or older (n=27) and black female who started using crack at the age of 35 or older (n=40)	Late-onset crack use	HIV risk	This finding suggests a typology of late-onset users with differing forms of HIV risk and prevention needs.
Logan	2003	Gender Difference in Context of Sex Exchange Among Individuals with a Hisotry of Crack Use	Cross-sectional	subsample (n = 1,261) of participants with a history of crack use in the Kentucky NIDA AIDS Cooperative Agreement who entered the study between February 1999 to August 2002. 148 male and 149 female	History of Crack Use	sex exchange practices	More partners and higher risk of STI associated with sex exchange among those with history of crack use
Narvaez	2014	Violent and sexual behaviors and lifetime use of crack cocaine: a population-based study in Brazil	Cross-sectional	1,560 participants aged 18–24 years	Use of alcohol and other substances, including crack cocaine	violent behaviors, firearm possession, and sexual risk behaviors	Lifetime use of crack cocaine was associated with episodes of aggression and firearm possession, as well as with a higher chance of not having used condom in the last sexual intercourse. In less conservative models, crack cocaine use was associated with other violent and sexual risk behaviors.
Sordo	2014	Cocaine use and risk of stroke: A systematic review	Systematic Review	All relevant bibliographic-databases were searched until January 2014: 9 total studies, 7 case–control studies (CCS) and 2 cross-sectional (CSS) studies	Cocaine Use	Stroke	Epidemiological evidence suggests that cocaine use increases the risk of stroke

Tang	2007	Comorbid Psychiatric Diagnoses and Their Association with Cocaine-Induced Psychosis in Cocaine-Dependent Subjects	Cross-sectional	243 unrelated cocaine-dependent adults [37% European American (EA), 52.3% African American (AA); 58.8% male]	Frequency and severity of cocaine-induced psychosis	Non-psychotic Axis I psychiatric diagnoses	Ninety percent of subjects met criteria for substance use disorders other than cocaine dependence; common non-substance- use disorders included antisocial personality disorder (ASPD), adult ASPD, major depression, and attention deficit- hyperactivity disorder (ADHD). Comorbid opioid dependence was more common in EA subjects than in AA participants. After correction for multiple comparisons, a lifetime diagnosis of ADHD was associated with the categorical presence of CIP (p ¼ 0.007), as well as significantly more severe CIP symptoms.
Tolou-Shams	2010	Crack and Cocaine Use among Adolescents in Psychiatric Treatment: Associations with HIV Risk	Cross-sectional	282 adolescents (mean age=14.9 years) treated in intensive psychiatric treatment settings	History of Crack or Cocaine Use	HIV Risk	After controlling for known factors that influence unprotected sex, the odds that those with a history of crack/cocaine use engaged in inconsistent condom use was six times greater than that for those youth who did not ever use.
Moura	2014	Crack/cocaine users show more family problems than other substance users	cross-sectional	741 current adult substance users from out patient and in patient Brazilian specialized clinics	Crack Cocaine Use	Family Problems	Cocaine users showed more family problems when compared with other drug users, with no significant difference between routes of administration. These problems included arguing (crack 66.5%, powder cocaine 63.3%, other drugs 50.3%, p=0.004), having trouble getting along with partners (61.5%664.6%648.7%, p=0.013), and the need for additional childcare services in order to attend treatment (13.3%610.3%65.1%, p= 0.002). Additionally, the majority of crack/cocaine users had spent time with relatives in the last month (84.6%686.5%676.6%, p=0.011).
Wallace	1990	Crack Cocaine Smokers as Adult Children of Alcoholics: The Dysfunctional Family Link	cross-sectional	crack-cocaine dpendent patients treated on an inpatient detoxification unit (n=61)	crack-cocaine dependence	adult child of an alcoholic status	61% of subjects were adult children of alcoholics, and 97% of them were adult children of a dysfunctional family, 25% domestic violence, and physical abuse (28%).

Table 5. Demographics of Crack/Cocaine Use

Primary Author	Year	Title	Study Type	Study Sample	Exposure	Measured Outcome	Findings
DAWN	2013	Drug Abuse Warning Network, 2011: National Estimates of Drug-Related Emergency Department Visits	Surveillance	National estimates of drug-related visits to hospital emergency departments (EDs) for the calendar year 2011	Illicit Drug Use	Emergency Visits	The highest rates of involvement were found for cocaine and marijuana (162 and 146 ED visits per 100,000 population, respectively). 45- to 54-year-olds had the highest rate for cocaine (344.6 visits per 100,000 population aged 45 to 54).
Ensminger	1997	The inner city and drug use: initial findings from an epidemiological study	Longitudinal	Young African American adults who, as children, started school in inner city neighborhood of Chicago, IL. Interviews from 1992-1994 when members wer 31-34 years old.	Race/Environment	Illicit drug use	Incarcerated respondents had higher rate of drug use (47% lifetime cocaine/crack use). Reported drug use within the past year was over 5x higher than the national average for cocaine/crack.
Golub	2013	Drug Generations in the 2000s: An Analysis of Arrestee Data	Cross-Sectional	arrestees in the 10 locations served by the Arrestee Drug Abuse Monitoring–II program: 37,933 adult male arrestees aged 18 and above who provided urine samples in Atlanta	Birth year	Illicit drug use	Crack use is still common among older arrestees but not among arrestees born more recently. Arrestees born before 1970 clearly comprised the Crack Generation; more than half of them were detected as recent cocaine/crack users (56%–65%).
Lillie-Blanton	1993	Probing the Meaning of Racial/Ethnic Group Comparisons in Crack Cocaine Smoking	Cross-Sectional	The 1988 NHSDA interviewed (n=)8814 individuals residing within households in the United States, 12+ years	Race/Ethnicity	Crack Cocaine Smoking	Once respondents were grouped into neighborhood clusters, the relative odds (RO) of crack use did not differ significantly for African Americans (RO, 0.85; 95% confidence interval [CI], 0.37 to 1.93) or for Hispanic Americans (RO, 0.88; 95% CI, 0.47 to 1.67) compared with white Americans. Encourages investigation of neighborhood and social environment.

Long	2014	Income level and drug related harm among people who use injection drugs in a Canadian setting	prospective cohort	n=1032 IDU in Vancouver, Canada	Income	Drug use patterns and related health risks	The highest income category was significantly associated with sex work (adjusted odds ratio [AOR] = 7.65), drug dealing (AOR = 5.06), daily heroin injection (AOR = 2.97), daily cocaine injection (AOR = 1.65), daily crack smoking (AOR = 2.48), binge drug use (AOR = 1.57) and unstable housing (AOR = 1.67).
Motivan	2009	Federal Justice Statistics, 2009	Surveillance	NA	NA	NA	Cocaine was the most common drug type involved in arrests by the drug enforcement administration (DEA) in 2009. 75% of crack cocaine arrests were black/African Americans suspects (2,115/2,870 arrestees). Crack cocaine arrests declined by 12% from the 3,254 reported in 2008.
SAMHSA	2011	Results from the 2011 National Survey on Drug Use and Health: Summary of National Findings	Surveillance	Persons age 12 and older	NA	NA	In 2011, there were 1.4 million current cocaine users aged 12 or older, comprising 0.5 percent of the population. These estimates were similar to the number and rate in 2010 (1.5 million or 0.6 percent), but were lower than the estimates in 2006 (2.4 million or 1.0 percent). In 2011, most (74.7 percent) of the 0.7 million recent cocaine initiates were 18 or older when they first used. The average age at first use among recent initiates aged 12 to 49 was 20.1 years. Perceived availability for adolescents has decreased.
Parker	2014	Should anyone be riding to glory on the now-descending limb of the crack-cocaine epidemic curve in the United States?	Longitudinal	Data from the US National Surveys on Drug Use and Health (NSDUH, 2002–2011; n > 500,000)	NA		There is a marked overall decline in year-specific incidence rates for crack-cocaine smoking from 2002 to 2011, especially 2007–2011.There is some variation in estimates of difficulty to acquire crack($p < 0.001$) and observed risk of using cocaine among ‘at risk’ susceptible ($p < 0.001$), but no appreciable shifts in duration of crack smoking among active users ($p > 0.05$) or in proportion of crack users receiving treatment ($p > 0.05$).

Table 6. Alcohol Outlets and Alcohol Consumption

Primary Author	Year	Title	Study Type	Study Sample	Exposure	Measured Outcome	Findings
Livingston	2007	Changing the density of alcohol outlets to reduce alcohol-related problems	Literature Review		Alcohol Outlets	Consumption, Violence, etc.	Use to find additional references
Pasch	2009	Alcohol outlets and youth alcohol use: Exposure in suburban areas	Cross-Sectional	n=242 high school adolescents - student/parentpairs from 7 county metropolitan area of Minneapolis/St. Paul, Minnesota	alcohol outlet density	alcohol use	Null findings: no association between high schooler's alcohol consumption and alcohol outlet density. May be affected by parent present and low density of outlets
Picone	2010	The effects of residential proximity to bars on alcohol consumption	longitudinal	four large U.S. cities from 1985 to 2001	density of bars	alcohol consumption	Adding a bar within a 0.5 km radius only increases consumption by 0.32 ml per day. Density of liquor stores, in analysis not reported here, has no statistically significant effects on alcohol consumption.
Pollack	2005	Neighbourhood deprivation and alcohol consumption: does the availability of alcohol play a role?	Cross-Sectional	1979 and 1990 Women and men (n = 8197) from four northern/central California cities and 82 neighbourhoods	alcohol availability (on-site and off-site)	alcohol consumption	The most deprived neighborhoods had substantially higher levels of alcohol outlet density than the least deprived neighborhoods (45.5% vs 14.8%, respectively). However, multilevel analyses showed that the least deprived neighborhoods were associated with the heaviest alcohol consumption, even after adjusting for individual-level socio-demographic characteristics (OR 1.30, CI 1.08–1.56). Alcohol availability was not associated with heavy drinking and thus did not mediate the relationship between neighborhood deprivation and heavy alcohol consumption.
Popova	2009	Hours and Days of Sale and Density of Alcohol Outlets: Impacts on Alcohol Consumption and Damage: A Systematic Review	Systematic Review	recent research studies published from 2000 to 2008 focusing on availability of alcohol	hours and days of sale (15) and density of alcohol outlets (44)	overall alcohol consumption, drinking patterns and damage from alcohol	The majority of studies reviewed found that alcohol outlet density and hours and days of sale had an impact on one or more of the three main outcome variables, such as overall alcohol consumption, drinking patterns and damage from alcohol.

Schonlau	2008	Alcohol outlet density and alcohol consumption in Los Angeles County and Southern Louisiana	Cross-Sectional	households in Los Angeles county and southern Louisiana (n=2881) nested within 220 census tracts	density of off-premise alcohol outlets	alcohol consumption	Alcohol outlet density was not associated with the percentage of people who were drinkers in either site. Alcohol outlet density was associated with the quantity of consumption among drinkers in Louisiana but not in Los Angeles. Outlet density within a one-mile buffer of the respondent's home was more strongly associated with alcohol consumption than outlet density in the respondent's census tract.
Scribner	2000	Evidence of a Structural Effect Density: A Multilevel for Alcohol Outlet Analysis	Cross-Sectional	2604 telephone households within 24 census tracts	alcohol outlet density	alcohol consumption	The effect of alcohol outlet density on alcohol-related outcomes functions through an effect at the neighborhood level rather than at the individual level
Scribner	2008	The Contextual Role of Alcohol Outlet Density in College Drinking	Cross-Sectional	students (N = 17,051) nested within college campuses (N = 32)	number of on-premise and off-premise alcohol outlets within 3 miles of campus per 1,000 students enrolled	Four problem-drinking-related outcomes (i.e., average number of drinks when partying, frequency of drunkenness in past 2 weeks, 30-day frequency of drinking, and greatest number of drinks in one sitting) along with individual level covariates of drinking were introduced at the student level.	Higher densities of on-premise alcohol outlets were strongly related to drinking outcomes even after controlling for individual predictors of college drinking. The association indicated that the campus means for the average number of drinks when partying and the number of drinking occasions in the past 30 days were, respectively, 1.13 drinks and 1.32 occasions greater when the outlet density was 2 SDs higher.
Shimotsu	2013	Neighborhood socioeconomic characteristics, the retail environment, and alcohol consumption: A multilevel analysis	Cross-Sectional	9959 adults living in a large Midwestern county	income, alcohol outlet density, and liquor stores and grocery stores	alcohol consumption	Retail mix was associated with binge drinking. Individuals living in census tracts with only liquor stores had a 46% higher risk of binge drinking than individuals living in census tracts with food stores only after controlling for demographic and lifestyle factors.

Theall	2011	The Neighborhood Alcohol Environment and At-Risk Drinking Among African-Americans	Cross-Sectional	321 African-American women and men ages 21 to 65 years recruited from April 2002 to May 2003 from three community-based healthcare clinics in New Orleans, Louisiana	liquor store, on-premise outlet, convenience store, and supermarket densities	at-risk alcohol consumption	The alcohol environment had a significant impact on at-risk alcohol consumption among African-American drinkers, specifically liquor store density (adjusted OR = 3.11, 95% CI = 1.87, 11.07). Furthermore, the influence of the alcohol environment was much stronger for African-American female drinkers (adjusted OR = 6.96, 95% CI = 1.38, 35.08).
Treno	2003	Alcohol Availability as a Predictor of Youth Drinking and Driving: A Hierarchical Analysis of Survey and Archival Data	Cross-Sectional	15- to 20-year-old adolescents and young adults California (n=667)	alcohol outlet densities	under-age drinking and driving	Older respondents were more likely to report drinking and driving and riding with drinking drivers, whereas females and Asians were less so. At the aggregate or city-level, alcohol outlet density, as measured by the number of on- and off-premises establishments licensed to sell alcohol, was associated with both drinking and driving and riding with drinking drivers. These effects were moderated by a number of individual level effects, with younger respondents and females more likely to be affected by outlet densities.
Wechler	2005	Secondhand effects of student alcohol use reported by neighbors of colleges: the role of alcohol outlets	Cross-Sectional	Adults from 4661 households in the United States	college's level of binge drinking and the number of alcohol outlets	lowered quality of neighborhood life through such secondhand effects (noise, vandalism or public disturbances)	A path analysis indicated that the number of nearby alcohol outlets was an important factor mediating the relationship between colleges, especially those with high rates of binge drinking, and such secondhand effects.
Weitzman	2003			(n =3,421; site n ¼ 8)	alcohol outlet density	frequent drinking and drinking-related problems	Density was correlated with heavy drinking (r =0.82; p = 0.01), frequent drinking (r = 0.73; p = 0.04) and drinking-related problems (r = 0.79; p = 0.02). Women, underage students and students who picked up binge drinking in college were affected.

Table 7. Alcohol Outlets and Violence

Primary Author	Year	Title	Study Type	Study Sample	Exposure	Measured Outcome	Findings
Alaniz	1998	Alcohol Availability and Targeted Advertising in Racial/Ethnic Minority Communities	Research Update/Summary	Literature	Alcohol Outlet Density	Homicide and Violence	Alcohol availability and advertising are disproportionately concentrated in racial/ethnic minority communities. Evidence shows a relationship between minority concentration, alcohol outlet density, and alcohol problems. This articl reviews research showing that neighborhood characteristics have a greater impact on violence than race/ethnicity.
Britt	2005	Neighborhood level spatial analysis of the relationship between alcohol outlet density and criminal violence	Cross-Sectional	data from 79 neighborhoods in the city of Minneapolis, Minnesota	Alcohol Outlet Density	Violent Crime	Our results indicate a significant positive relationship between alcohol outlet density and violent crime
Escobedo	2002	The relationship between liquor outlet density and injury and violence in New Mexico	Cross-Sectional	data from 1990 to 1994 gathered from forensic, vital statistic, census, law enforcement and liquor licensing agencies	Liquor Outlet Density	alcohol-related health outcomes	Data also show that, compared with the first tertile, suicide and alcohol-related crash rates increase about 50% and the alcohol-related crash fatality rate two-fold with the third tertile of liquor outlet density. Greater availability of liquor outlets is associated with higher rates of suicide, alcohol-related crash, and alcohol-related crash fatality.
Gorman	1998	Risk of Assaultive Violence and Alcohol Availability in New Jersey	Cross-Sectional	Data were derived from 223 widely distributed New Jersey municipalities with populations greater than 10000.	Alcohol Outlet Density	Violent Crime	Our findings from a study of 223 municipalities in New Jersey do not demonstrate a geographic association between rate of assaultive violence and density of alcohol outlets.
Gorman	2001	Spatial Dynamics of Alcohol Availability, Neighborhood Structure and Violent Crime	Cross-Sectional	98 block groups in Camden, New Jersey (urban community)	Alcohol Outlet Density	Violent Crime	Each type of analysis showed that those areas with high alcohol outlet densities experienced more violent crime than lowdensity areas, after controlling for neighborhood social structure

Gorman	2005	Drug 'hot-spots', alcohol availability and violence	Cross-Sectional	439 census tracts from Houston, Texas	Alcohol Outlet Density and Drug Crime Density	Violent Crime	Using ordinary least-squares analysis, the neighborhood socio-structural covariates explained about 40% of the variability in violent crime. Adding alcohol outlet density in the target census tracts explained an additional 6%, while the addition of drug crime density explained an additional 32%.The findings indicate that drug crime density explained a greater amount of variance in violent crime rates than the alcohol outlet density.
Gruenewald	2006	Ecological models of alcohol outlets and violent assaults: crime potentials and geospatial analysis	Cross-Sectional	data on hospital discharges for violent assaults were obtained for residents of 1637 zip code areas in California	Alcohol Outlet Density	Assault	Assault rates were related significantly to local densities of off-premise alcohol retail establishments, not bars. However, densities of bars moderated substantially effects related to local population characteristics. Bars were related significantly to violence in unstable poor minority areas and in rural middle-income areas of the state.
Gruenewald	2006	Changes in Outlet Densities Affect Violence Rates	Longitudinal	581 consistently defined California zip codes over 6 years	Alcohol Outlet Density	Violent Crime	Assault rates were most strongly related to median household incomes and minority populations within zip code areas. Controlling for changes in assault rates related to these measures, greater numbers of licensed alcohol retail establishments, especially bars and off-premise outlets, were related to rates of assault.
Lipton	2002	The Spatial Dynamics of Violence and Alcohol Outlets	Cross-Sectional	Zip code areas (N = 766) in California from four distinct areas (three urban and one rural)	Alcohol Outlet Density	Violence	The density of bars was found to be strongly associated with greater rates of assault, while density of restaurants was associated with less violence. Both appeared to have greatest effect in densely populated areas. Local and nearby population characteristics were also found to be related to greater rates of violence.

Lipton	2013	The Geography of Violence, Alcohol Outlets, and Drug Arrests in Boston	Cross-Sectional	544 census block groups of Boston, MA	alcohol outlets, drug markets (approximated by arrests for possession and trafficking)	Violence	Relative to other block groups, block groups in the highest decile of violent crime (n = 55) were found to be poorer (e.g., lower incomes, higher percentages of vacant homes), and they had greater numbers of alcohol outlets and higher drug arrest rates. Alcohol outlets and drug possession and trafficking arrests were predictive of violent crime.
Neilson	2003	REASSESSING THE ALCOHOL VIOLENCE LINKAGE: RESULTS FROM A MULTIETHNIC CITY	Cross-Sectional	70 census tracts in the city of Miami with 500 or more residents	Alcohol Outlet Density	total violence (robbery and aggravated assaults) and aggravated assaults and robberies,	The results revealed that alcohol availability is strongly associated with the violent crime rates we considered. For total violence and its component measures of aggravated assault and robbery rates, total alcohol outlets is a positive predictor net of social disorganization and other variables included in the models.
Reid	2003	Generalizing the Alcohol Outlet–Assaultive Violence Link: Evidence from a U.S. Midwestern City	Cross-Sectional	89 inner-city census tracts in Kansas City, Missouri	Alcohol Outlet Density	Assaultive Violence	Alcohol-outlet density contributed significantly to the explained variance of the regression model and was associated with higher rates of assaultive violence in this Midwestern city.
Roncek	1991	Bars, Blocks, and Crimes Revisited: Linking the Theory of Routine Activities to the Empiricism of "Hot Spots"	Cross-Sectional	4,396 residential city blocks of Clevelend, OH	Alcohol Outlet Density	Crime	The amount of crime of every type was significantly higher on residential blocks with taverns or lounges than on others.
Scribner	1995	The Risk of Assaultive Violence and Alcohol Availability in Los Angeles County	Cross-Sectional	Los Angeles County	Alcohol Outlet Density	Assaultive Violence	Higher levels of alcohol-outlet density are geographically associated with higher rates of assaultive violence, independent of unemployment, ethnic/racial makeup, income, age structure, city size, household size, and female-headed house-holds.
Scribner	1999	Alcohol Availability and Homicide in New Orleans: Conceptual Considerations for Small Area Analysis of the Effect of Alcohol Outlet Density	Cross-Sectional	155 urban residential census tracts in New Orleans	Alcohol Outlet Density	Homicide Rates	Both off-sale alcohol outlets per square mile and off-sale outlets per person demonstrate strong geographic associations with homicide rates among urban residential census tracts in New Orleans.

Speer	1998	Violent Crime and Alcohol Availability: Relationships in an Urban Community	Cross-Sectional	Newark, NJ: census tracts (n=91), census block groups (n=217)	Alcohol Outlet Density	Violent Crime	Association between alcohol outlet density and violent crime
Zhu	2004	Alcohol Outlet Density and Violence: A Geospatial Analysis	Cross-Sectional	188 census tracts from Austin Texas, 263 tracts from San Antonio, TX	Alcohol Outlet Density	Violent Crime	Alcohol outlet density in the target census tract remained a significant predictor of violent crime rates in both cities when the effects of auto-correlated error were controlled for. In Austin, the effects of alcohol outlet density in the adjacent census tracts also remained significant.
Zhu	2006	Hierarchical Bayesian spatial models for alcohol availability, drug "hot spots" and violent crime	Cross-Sectional	City of Houston, Texas, using a sample of 439 census tracts	Alcohol Outlet Density	Illicit Drug Use and Violence	The analysis presented suggests that activity around illicit drug markets is more strongly associated with violent crime than is alcohol outlet density

Table 8. Alcohol Outlets and Other Neighborhood Issues

	Primary Author	Year	Title	Study Type	Study Sample	Exposure	Measured Outcome	Findings
Other								
	Donnelly	2006	Liquor outlet concentrations and alcohol-related neighbourhood problems	Cross-Sectional	National Crime and Safety Survey (2002) was conducted using data from survey participants who resided in NSW	Liquor Alcohol Outlet Density	(1) reported problems with drunkenness in the neighbourhood, (2) reported problems with property damage in the neighbourhood	Multilevel modelling of these data showed that respondents who lived closer to liquor outlets were more likely to report problems in their neighbourhood from drunkenness and property damage, controlling for socio-demographic factors.
Child Maltreatment								
	Freisthler	2004	A spatial analysis of social disorganization, alcohol access, and rates of child maltreatment in neighborhoods	Cross-Sectional	Substantiated reports of child maltreatment for 940 census tracts in three counties in California	neighborhood social disorganization and alcohol access	Child Abuse and Neglect	Spatial regression models show that neighborhoods with higher percentages of poverty, female-headed households, Hispanic residents, population loss, and greater densities of bars have higher rates of child maltreatment.
	Freisthler	2004	Alcohol Outlets and Child Physical Abuse and Neglect: Applying Routine Activities Theory to the Study of Child Maltreatment	Cross-Sectional	Substantiated reports of child maltreatment for 940 census tracts in three counties in California	number of bars, restaurants and off-premise outlets per population	Child Abuse and Neglect, while controlling for levels of social disorganization, population density and county of residence.	The number of off-premise outlets per population was positively associated with rates of child physical abuse (b = 3.34, SE = 1.14), and the number of bars per population was positively related to rates of child neglect (b = 1.89, SE = 0.59).
	Freisthler	2014	Inadequate child supervision: The role of alcohol outlet density, parent drinking behaviors, and social support	Cross-Sectional	50 cities throughout California (n=3023)	Alcohol Outlet Density	supervisory neglect parenting practices	The density of on premise alcohol outlets was positively related to leaving a child home alone when an adult should be present
	Morton	2014	Neighborhood alcohol outlet density and rates of child abuse and neglect: Moderating effects of access to substance abuse services	Cross-Sectional	163 Census Tracts in Bergen County, NJ	Alcohol Outlet Density	Child Abuse and Neglect	Findings indicate areas with a greater concentration of on-premises alcohol outlets (i.e.,bars) had higher rates of child neglect

Pedestrian Injury								
	LaScala	2001	Neighborhood Characteristics of Alcohol-Related Pedestrian Injury Collisions: A Geostatistical Analysis	Cross-Sectional	four California communities	Alcohol Outlet Density	pedestrian injury collisions	The results showed that alcohol-involved pedestrian collisions occurred more often in areas with greater bar densities and greater population, and where the local population reported drinking more alcohol per drinking occasion.
Rates of STI								
	Cohen	2006	Alcohol outlets, gonorrhea, and the Los Angeles civil unrest: A longitudinal analysis	Longitudinal	1481 census tracts in Los Angeles County from the 1990 US Census	Alcohol Outlet Density	Gonorrhea cases	After the civil unrest, a unit decrease in the number of alcohol outlets per mile of roadway was associated with 21 fewer gonorrhea cases per 100,000 (po.01) in tracts affected by the Unrest compared to those not affected.
	Scribner	1998	A Geographic Relation Between Alcohol Availability and Gonorrhea Rates	Cross-Sectional	155 urban residential census tracts in New Orleans during 1995	Alcohol Outlet Density	Gonorrhea cases	All alcohol outlet density variables were positively related to gonorrhea rates. Off-premis outlets per sq. mile was most strongly related to gonorrhea rates (B=0.582, +/- 0.073), accounting in 29% variance of gonorrhea rates.