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Quarter 2 Preliminary Report:
An Exploratory Study of Environmental
Stress in Four High Violent Crime Cities:
What Sets Them Apart – Phase 1

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Abstract

Understanding the social contexts of violent crime remains controversial in the scientific literature. In the current study, we sought to examine for common social contexts in four cities (Houston, TX, Baltimore, MD, Jackson, MS, Wilmington, DE). Data were examined in two studies. In the first, each city was compared to national county-level data on health outcomes. In the second, communities within the four cities were examined for predictors of crime. Results suggest that some common social contexts emerge: high STD rates, air pollution, single-parent homes, insufficient food resources and sleep, residential segregation, housing costs burdens, comparatively few older adults and comparatively more females, were common among the four high-violence cities. By contrast, all four cities unexpectedly had uncommonly low suicide rates compared to the national average. At the community level, unemployment, community stress, median household income and population density all predicted criminal outcomes. On the issue of race, high-violence cities tended to have higher proportions of Black residents, however community level evaluations suggested that class-related issues, not race per se, was predictive of violent crime.

Key words: Violent crime; Economics; Social Stress; Race

An Exploratory Study of Environmental Stress in Four High Violent Crime Cities: What Sets

Understanding social correlates of violent crime remains an important task. We sought to conduct an ecological investigation comparing factors for crime in the Center for Justice and Research's national study of several high-crime US cities. We investigate several different factors in this research and their interaction with violent and property crime. We first explain our approach and why we chose the factors we did, our methods in greater detail and what we found in light of the literature.

The ecological and factor prevention approach flows from an approach in social science which evolved a few decades ago (Bonfenbrenner 1979). The approach is to first look to the environment and personal identifiers for the area and determine certain attributes simultaneously occurring with or preceding crime. This approach was wrought from the public health approach that predated its inception in criminology (where it was used to diagnose and ultimately militate against impactful pathogens within a particular community). Loeber and Farrington (1998) presented a detailed exposition of this paradigm as applied to serious and violent juvenile offenders. Empirical research continues to show that violent and property offenders have different factors from others and intervention efforts aimed at addressing these factors is critical for reducing initial crime or recidivism. In other words, by understanding the social contexts in which crime occurs, we may have a better understanding of how to prevent it in the future. However, attempting to disentangle this has proved difficult.

This exploratory approach concerns itself less with causes and more with correlates that appear with crime or other risk factors. In other words, the factors suggested by the research to accompany or precede crime are essentially that and beneficial for that designation without

associative or causal properties. This is exemplified in quite a few studies over the last few decades.

Individual risk factors of crime have been extensively researched. Most of these studies include consideration of age, gender, and race. Much of the literature suggest that violent crime begins at ages of 14 and 18 years (Glesman, Krisberg, & Espelage, 2015) . However, some studies have found the age of entry to be significantly younger, noting an average age of entry of 11 years (Klein, 1995). Regarding race, Black and Latino Americans tend to be overrepresented as perpetrators of violent crimes (Beck, 2021) although this may relate to social stress and class factors rather than race per se.

Structural causes have been studied as well. Crime is associated with disadvantaged neighborhoods, and the literature suggests a relationship between community factors and property as well as property crime. The presence of violence and disorganization in the neighborhood also increases crime involvement. Likewise, the presence of adult support (as in 2 parent households, etc.) in a neighborhood and feelings of safety in a community are less likely to beget crime (Merrin, Hong, & Espelage 2015). However, much of this literature can grow redundant or circular in reasoning and so other domains of risk have been explored from a greater ecological contextualism. These can be classified as 1) Health Practice and Health Outcomes as well as 2) Social, Economic Factors and Physical environment.

Healthy Practice and Outcomes

Physical health outcomes have been found to correlate with crime. Unhealthy environments are associated with adverse mental health and psychological distress (Beck et al. 2013). Cross-sectional evidence from nationally representative data has explained that lower levels of physical and mental well-being has been associated with crime (Sundaresh et. al. 2020).



Further, lower levels of well-being (mental and physical) have been found to correlate with higher levels of exposure to police stops, arrests, and of course, incarceration (Hobbs, et.al. 2021). More specifically, longer durations of incarceration and multiple incarcerations have been associated with progressively lower well-being. Those who have been stopped and frisked by the police have reported low well-being similar to that of those who had been incarcerated (Sundaresh et al., 2020). Further empirical work is needed to determine if lower well-being is associated with any exposure to police and similarly, more involved exposure suggests lower well-being and other impairments such as respiratory trouble, obesity, drug abuse, etc.

One of these impairments may be Asthma Morbidity. A relationship between asthma impairment and crime has been found in research regarding criminal offenders (Beck et al. 2013). Another may be obesity, higher neighborhood crime is longitudinally, positively associated with greater body mass index among neighborhood residents (Richardson et. al. 2017).

However, it may not be that obesity is causing greater crime; indeed, this seems unlikely. Crime and obesity and other unhealthy practices/outcomes may be results of the same phenomenon. For example, greater community property crime correlates with obesity and physical inactivity (Yu et al. 2016). Decreases in healthy food availability has been significantly associated with a higher violent crime rate and increased availability of supercenters and fast-food restaurants has been associated with a higher violent crime rate (McGuirt et al. 2019). Alcohol availability use is another factor. Myers et al, 2016 found a positive relationship between alcohol outlet density within neighborhoods and crime within neighborhoods after their review of the American Community Survey. Study at the local or county level for research on the role of the retail food environment in community violence when controlling for other



sociological and health-related factors has shown a positive relationship between unhealthy food establishments and violent crime (Singleton et al, 2019).

Similarly, insufficient sleep is another common presence in certain circles that can have its own relationship with crime, both direct and indirect. Sleep disorder correlates with significant acute and long-term negative health outcomes. Further, insufficient sleep is associated with adverse physical, behavioral, and psychosocial consequences among youth and associated with a greater increase in criminal outcomes (Hildebrand et. al., 2013). Sleep problems may be important contributors to aggression, especially in the domains involving intimate partner violence, school and cyber bullying, and institutional aggression within psychiatric and correctional institutions (Krizan & Herlache, 2016).

Another community problem correlating with crime is mental health. Although arguments regarding causality may be made for both as causal agents in the relationship (Lorenz et al, 2012) and the effect of local crime on mental health (Dustmann & Fasani, 2016), reciprocity and the cycle it creates, when exacerbated by low income may be the most likely conclusion. Community crime has been associated with alcohol abuse, depression and anxiety symptoms after controlling for other community covariates such as income, explaining 4% to 5% of variability in treatment outcomes. Further, patients living in low-income areas required a higher number of treatment sessions to benefit from therapy. Patients living in economically deprived neighborhoods tend to have poorer depression and anxiety treatment outcomes and require lengthier interventions. They may have less access to clinical care than comparable urban and rural areas. (Finnegan et al, 2020).

Crime has been associated with certain communicable, biological pathogens as well. For example, Chlamydia has been associated with violent and non-violent crime. (Marotta, 2017).



Similarly, HIV and other STD's have been suggested as correlates with violent and non-violent crime (Bonar et. al. 2016). Exactly how this relationship between STD rates and violent crime rates in a community evolve is poorly understood. Some suggest the reasons for this relationship is not just the direct effects of illegal drug use on STD transmission but also the presence of both in similar counter cultures-suggesting direct and indirect effects (Taylor, 2011). However, once again, we caution that issues such as STD rates may represent community “red flags” rather than causal influences.

Empirical study suggests that access to certain health improving sites or agencies can reduce unhealthy practice and diminish unhealthy outcomes such as crime. Improving access to care and reducing involvement in the criminal justice system for people with mental illness correlates with less crime (McGinty et al., 2018). Increase in the number of open mental healthcare offices has been found to correlate with reductions in unhealthy behavior. These findings suggest an unintended benefit from expanding the office-based mental healthcare workforce on reductions in crime (Deza et al., 2020).

Social, economic factors and physical environment

Crime and location research has demonstrated that crime is not homoscedastic across space, even when reviewed in nesting sites suggested to attract crime such as red-light districts or liquor establishments (Eck, Clarke, & Guerette, 2007). It is rather concentrated at relatively few locations, suggesting a particular inclusion of similar characteristics with physical and social descriptions determining the intra-community variation in crime (Sherman, Gartin, & Buerger, 1989; Weisburd, 2015). We therefore examine the extent to which neighborhood features are associated with violent, property, and drug crime at low-income housing developments.

Location of and status of housing may play a role. Dunworth and Saiger (1994), looked at crime in public housing developments across Washington, DC, Los Angeles, and Phoenix found that the rates of violent and drug offenses within the housing developments were consistently higher than nearby neighborhood rates, and substantially higher than citywide rates. Similarly, Holzman, Hyatt, and Kudrick (2005) examined crime in and around public housing in three unidentified cities and report that the risk of aggravated assault in public housing developments was higher than in the 300-m buffers surrounding the developments, which in turn were more dangerous than the jurisdiction as a whole. Within this line of thought are suggestions that air pollution and overcrowding may affect the crime rate as well. Bondy et al., 2020 found that air pollution has a positive and statistically significant relationship with overall crime, particularly property crime. They report the greatest effect within pollution levels below regulatory standards and such motivation appears to be unevenly distributed across income groups. Further, many studies suggest that overcrowding may be an issue that encourages crime although evidence within the United States has been inconsistent (Roncek et al., 2018; McCarty, 2010).

Income inequality may be one of the greatest correlates with crime. Most of the literature on the effect of income inequality on crime and violent acts finds that the impact is a positive relationship between the two (Ehrlich 1973; Sampson 1984; Kelly 2000; Enamorado et al. 2016). The reported positive relationship between inequality and crime may be largely driven by economic segregation across communities, rather than simple aggregate measures. (Kang, 2016). Looking within counties or cities may be more beneficial since much street crime involves a perpetrator and victim from the same “street” (Kang, 2016).

Thus, feelings of economic security in the community tend to mitigate crime and feeling of insecurity spawn crime through retaliatory tactics or gang membership (Merrin, Hong, &

Espelage 2015). Other factors include single-parent households. Single-parent families are associated with increased criminal behavior among youth raised in such households, although this appears to interact with other community factors (Wright and Younts 2009).

Research on segregation that involve multilevel models of crime suggest that, net of city-level and neighborhood characteristics, racial segregation within a city is significantly related to greater violent and property crime. Multi-level model studies have found racial segregation of low income from high income households is connected with higher crime, particularly neighborhood violence. (Krivo et al., 2015) This may be the result of the nature of social and political processes within U.S. cities that are difficult to operationalize in even ecological studies. For example, Houston, a city with a large non-European, White population, has a long history of structural fiscal inequality and institutional difficulties potentially encouraging serious disinvestment and political neglect that encourage decline in such communities. Similarly, other similar analysis has found economic segregation is as affective as racial segregation in cities. It is associated with greater crime and other social problems for neighborhoods with high concentrations of disadvantaged and minority residents (Kang, 2016; Krivo et al., 2009, Browning et al., 2010).

The Current Study

Given various threads of research examining social predictors of crime, we wished to examine for patterns in several high-violent crime cities to examine which predictors were the most consistent. The four cities chosen were Houston, TX, Baltimore, MD, Jackson, MS, and Wilmington, DE and they were chosen for... These cities will be examined with two analyses. The first will compare the four cities against national rates of social stress indicators. The

second will examine communities within these four cities to see what factors are most associated with crime.

Study 1

Methods

Materials and Procedure

In order to determine the degree and extent of public health, we utilize the County Health Rankings Dataset (CHRD). This dataset has been compiled yearly by the Robert Wood Johnson Foundation and the University of Wisconsin Pollution Health Institute since 2010 (Remington, Catlin, & Gennuso, 2015). A collection of 30 county-level measures, the CHRD provides an understanding of the collective health of its members (health outcomes - mortality and morbidity) and those factors found to impact future health (health factors - health behaviors, clinical care, social and economic factors, and the physical environment).

Examining the factors that summarize the factors that contribute to health and overall health outcomes, the County Health Rankings Dataset allows us to determine the level of health in over 3,000 U.S. counties. More importantly, we are able to supplement our analysis by including measures of teen birth rate, percent of adolescents living in poverty and the degree and extent to which disparities exist in the counties under question. The county level analysis allows us to overcome the challenges associated with the more often used aggregate level national data and its associated challenges.

For the current study the following variables were considered: county-level rates of poor health, adult smoking, adult obesity, excessive drinking, chlamydia diagnosis, teen births, HS Graduation, unemployment, children in poverty, income inequality, single parent households, violent crime, injury deaths, air pollution, severe housing problems, physical distress. Mental

distress, diabetes prevalence, HIV prevalence, food insecurity, drug overdose mortality rate, insufficient sleep, math scores, median household income, proportion of children eligible for free or reduced price lunch, residential segregation Black/White, residential segregation non-White/White, homicide rate, suicide rate, firearm fatalities, juvenile arrest rate, percent housing cost burden, percent under 18, percent over 65, percent Black, percent non-English Speaking, percent female. Included in the dataset were data from 3,195 US counties.

Analyses used were one-sample t-tests. Target values were each of the values for the county in which the 4 target cities were located. Separate t-tests were run for each city comparing the US counties average against the value for that city for each variable. For instance, for suicide rates, 4 one-sample t-tests were run comparing the US counties mean value to the target values for Houston, Baltimore, Wilmington and Jackson.

Exploratory analyses with such large datasets carry significant rates for spurious results to be “statistically significant.” This can result in misidentification of trivial predictors as important and inflated Type I error rates. This was addressed in two ways. First, a minimal p -value standard was employed ($p < .005$; Benjamin et al., 2017). Second, effect sizes need to reach a minimum of $r = .10$. This was selected as values below this are typically difficult to distinguish from noise due to the limits of precision in social science research (Ferguson & Heene, in press). Together, these procedures should indicate which social predictors were both most consistent and strongest in this database. We certify that we are reporting all analyses conducted whether significant or not.

Results

Results from the t-test analyzes are presented in Table 1. In most cases, social stress variables were hypothesized to be higher in the four high-crime cities. Where the outcome was inverse of this, the outcome was coded as non-significant, essentially making these one-tailed tests. There were some exceptions such as demographic variables (percent female, for example) which were kept as two-tailed and reported as such. Also, one social stress variable (suicides) had strong and consistent evidence in an unexpected direct and, as such, was worth considering. In most other cases, opposing results were indicative of lack of consistency between cities and is interpreted as such.

Table 1: T-test results Comparing 4 Cities to US County Data on Social Stress Indicators

<u>Indicator</u>	<u>Houston</u>	<u>Baltimore</u>	<u>Wilmington</u>	<u>Jackson</u>
Poor Health	-12.88	x	x	-36.83
Adult Smoking	x	x	x	-24.02
Adult Obesity	x	x	x	-43.52
Excessive Drinking	-44.33	x	-26.39	x
Chlamydia	-37.03	-26.42	-31.08	-31.08
Teen Births	-16.48	x	x	-16.48
HS Graduation	13.01	x	x	114.16
Unemployment	-10.23	x	x	-17.79
Children in Poverty	-25.20	x	x	-50.07
Income Inequality	-36.05	23.50	-6.28	-36.05
Single Parent Household	-19.36	-8.69	-19.36	-136.69

Violent Crime	-135.11	-72.94	-84.29	-142.21
Injury Deaths	-168.26	-44.99	-19.20	x
Air Pollution	-85.40	-53.97	-28.25	-48.25
Severe Housing Problems	-75.33	-25.87	x	-87.70
Frequency of Physical Distress	x	x	x	-21.06
Frequency of Mental Distress	x	x	x	-28.7
Diabetes Prevalence	x	x	x	-26.75
HIV Prevalence	-107.31	-63.13	-56.23	-195.38
Food Insecurity	-256.5	-23.69	-14.1	-11.63
Drug Overdose	x	-93.59	-52.56	x
Insufficient Sleep	-11.81	-12.84	-53.69	-67.31
Math Scores	x	x	16.85	64.85
Median Household Income	x	x	x	33.24
Children/Reduced Price Lunch	-30.93	x	NA	-104.98
Res. Segregation Black/White	-7.75	-34.87	x	-32.07
Res. Segregation non-White/White	-20.2	-76.03	-27.81	-96.12
Homicides	-16.11	-4.33	-11.65	-143.41
Suicides	50.53	53.62	47.2	53.62
Firearm Fatalities	x	x	x	-105.26
Juvenile Arrests	x	-37	-49.46	x
Percent Housing Cost Burden	-68.17	-42.45	-42.45	-89.65
Percent Under 18	-74.52	7.75	9.39	-33.06
Percent Over 65	104.86	24.36	43.64	61.71

Percent Black	-38.57	-79.21	-62.95	-251.33
Percent non-English Speaking	-203.97	-5.75	-5.75	x
Percent Female	-10.58	-67.32	-39.93	-84.75

Note: x = did not meet threshold for “significance.” NA = data not available.

Summarizing the results from the table, the following social stress indicators were consistent across all four cities: Chlamydia rate, single parent households, violent crime rate, air pollution, HIV prevalence, food insecurity, insufficient sleep, residential segregation white/nonwhite, homicides, suicides, percent housing cost burden, percent over 65 (all four cities were “younger” than the national average), percent Black, percent female (all four cities had proportionally more females than the national average.) Taken together, economic and stress factors appear consistent across the four cities (income inequality was also significant for three of the four cities). Target cities also tended to be younger, more Black, had more females, and experienced more segregation than other parts of the US.

Brief Discussion of Study 1

A few variables warrant a closer look at this point. First, interestingly enough, STD rates, both Chlamydia and HIV are higher in the target cities. It is unlikely that such effects are necessarily causal but may be indicative of a general culture of risk taking in these cities, higher than the national average. This may indicate that these cities suffer from wider public health issues that are impacting numerous outcomes.

Second, the results for suicide are interesting. All four target cities had considerably *lower* suicide rates than the national average. This may seem counterintuitive given the expectation that both violent crime and suicide may result from stress. However, this result is consistent with a recent cross-national study which found that suicides are higher in wealthier nations, whereas homicides were more common in countries with higher income inequality (Ferguson & Smith, in press). As such, violent crime and suicide may be best conceptualized as existing along divergent stress paths.

Third, we note that our analysis confirmed other data (Beck, 2021) which finds violent crime higher among Black Americans. However, we note that this issue is complex, and it may not be that race, per se, is the relevant factor but rather than class-based issues involving economic disadvantage and social stress may be more salient. This, however, can only be tested in multivariate analysis and it is to this that we now turn.

Study 2

Methods

Materials and Procedure

The most obvious critique of study 1 is that the data is county level and as such treats even of the four target cities (and surrounding municipalities) as whole units. However, much community variation is to be found within cities as well as between. Also, our previous analyses were univariate, not multivariate.

To test for variations within cities, we sought to examine communities at the level of zip code (the narrowest level we had available). To do this, we took data from two sources. The first of these was the Area Deprivation Index (ADI; Kind & Buckingham, 2018) which provides



state and national level rankings of communities based on an analysis of education, employment, housing and income. The second was the Livability Index which is compiled from US Census Data and FBI crime data (Areavibes, 2021). From this, we were able to get US government data compiled for violent crime, property crime, mean household income, unemployment, academic test scores, percent Black residents and population density.

From this data, we were able to employ multiple regression analyses. OLS regression models were compiled with pairwise deletion for missing data. ADI state and national ranks were collinear and, as such, were considered in separate models. Predictor variables included ADI (both state and national rankings, in separate models), mean household income, unemployment, academic test scores, percent Black residents and population density. Outcome variables were property and violent crime rates. Thus, there were four separate models.

We note also that it would be reasonable to assume that zip codes are nested within cities and so the analyses reported below were retested with hierarchical linear modeling. This did not substantially impact our results so the OLS models are reported. As the models for ADI state and national were similar for all other variables and overall model statistics, the main statistics for ADI state models are reported, with the regression weights for ADI national added to the Table.

Results

Note, all results are reported in Table 2. As noted above, the standardized regression weights for ADI state and national are reported together, though separate models were run for each due to collinearity issues.

Table 2 Regression Results for Study 2, Standardized Regression Coefficients and p-values

Predictor Variable	Violent Crimes	Property Crimes
Unemployment	.228, $p = .002$.368, $p = .001$
Median Household Income	-.341, $p < .001$	-.003, $p = .979$
Test scores	-.151, $p = .009$	-.039, $p = .663$
Percent Black	.097, $p = .041$.058, $p = .338$
Population Density	.283, $p < .001$.057, $p = .434$
ADI State Rank	.144, $p = .014$	-.341, $p < .001$
ADI National Rank	.080, $p = .208$	-.280, $p = .002$

Property Crimes

For property crimes, the overall regression models were statistically significant [ADI State model, $R = .365$, $R^2_{adj} = .107$, $F(6, 201) = 5.15$, $p < .001$]. As can be seen in Table 2, both state and national ADI as well as unemployment were significant predictors of property crimes. All other variables were non-significant.

Violent Crimes

For violent crimes, the overall regression models were statistically significant [ADI State model, $R = .754$, $R^2_{adj} = .556$, $F(6, 201) = 44.27$, $p < .001$]. As can be seen in Table 2, most of the significant predictors were unrelated to ADI (state ADI had a small correlation with violent crimes, albeit in the opposite direction from expected). Unemployment, media household income, academic test scores, and population density were all significant predictors. Percent

Black reached statistical significance, but the effect size was smaller than the $r = .10$ standard we adopted for interpretation. Thus, such a result is judged as trivial and potentially noise.

As indicated above, retesting these models with zip codes nested within cities using HLM did not substantially change these results.

Brief Discussion of Study 2

Results from this study found that, at the community level as defined by zip code, multiple community stress factors were associated with violent crime. For property crime, however, only unemployment and ADI were related to higher rates of property crime. This suggests that property crimes may be more narrowly related to economic factors, whereas violent crimes are related to more general community stress.

As to the issue of race, race was not predictive of either crime outcome, particularly using the $r = .10$ cutoff. This suggests that, community factors related to stress and class are predictive of crime perpetration, rather than race per se.

Discussion

Numerous factors have been proposed as possible correlates of crime. It can be valuable to look for common patterns related to community stressors as they relate to crime. We sought to address this in two studies of four high violent crime cities. Our results suggest that community stress as relates to health and economics are associated with violent crime.

Our results suggest that economic factors (such as state ADI rank, unemployment, median household income, population density) predict crime. Throughout our findings this is a consistent outcome, and it is consistent with the preponderance of the literature on criminal causality in criminal justice, criminology, psychology, sociology, and public health. This consistency strongly buttresses the proposition that economic factors leads to property and



violent crime. Some research suggests that the primary risk for early onset of offending before the age of twenty includes socio-economic factors such as large family sizes and low family income (Farrington, 2003). The research suggests an abundance of causes, particularly when looking at youth.

There is discussion in the literature regarding whether unemployment affects the crime rate or must act in accord with other demographic characteristics to affect crime. Steven Raphael and Rudolf Winter-Ebmer (2001) found an effect of unemployment on property crime rates. The estimates suggest that the decline in property crime rates during the 1990s is attributable to the decrease in the unemployment rate (Raphael & Winter-Ebmer, 2001). However, Britt (1997) found that the effects of unemployment (by measuring unemployment) on broad arrest rate (robbery, arson, theft) are contingent on age group and the time period. One of the aspects of our own findings, suggest that race has no significant effect on crime, when controlling for unemployment and other economic factors. In effect, in discussions of race and crime, it may help to understand that race functions mainly as a proxy for class issues, and addressing those class economic issues may decrease crime propensity for all ethnic groups.

Among our findings was the observation that single-parent households are associated with higher violent crime. This is consistent with other research finding that growing up in a single-parent household is associated with an increased risk of involvement in a crime (Kroese et al., 2020). Criminal behavior, particularly in adolescents, corresponds with chronic deprivation of parental acceptance; thus, the abandonment of a fatherly figure furthers the aggressiveness due to family turmoil (Fagan, 1995). One significant cause of poverty is fatherless families (Fagan, 1995). For example, the absence of a father leads to a heightened risk of lower intellectual development, illegitimate parenting in teenage years, and higher welfare dependency from the



single mother (Fagan, 1995). As a result, this increases the risk of adolescent criminal behavior. On the other hand, a distant relationship between a mother and child can lead to neglectful and abusive relationships that can cause an adolescent to become emotionally detached and become delinquent (Fagan, 1995).

There are mixed results on the impact of food insecurity and violence. Jonathan Caughron (2016) found that a one percent increase in food insecurity leads to a twelve percent increase in violent crime rates when holding other predictors of violent crime constant. However, the impact of food insecurity on crime rates depends on the income level and population of the county (Caughron, 2016). On the other hand, Emily Blankenberger (2016) found no statistically significant relationship between food insecurity and violence. The overall effect of food insecurity varies when it comes to an individual's income and living location, such as urban or rural areas. Food insecurity is a health problem that does cause violence in undeveloped nations (Blankenberger, 2016). In the United States though, this may be a step in the chain between impoverished areas and crime.

Another aspect potentially addressing the connection between poverty and crime may be a lack of sleep. Adolescents tend to have a rising number of sleeping problems and an inadequate amount of sleep (Backman et al., 2015). A loss of sleep is often related to diminished behavioral responses and an increase in irritability and hostility (Backman et al., 2015). Therefore, sleep difficulties and an inadequate amount of sleep are associated with delinquent behavior, particularly in adolescents (Backman et al., 2015). Research also suggests that a lack of sleep from a partner increased aggressiveness and the likelihood of domestic violence (Hoshino et al., 2008). However, other research indicates that sleep deprivation is more associated with property crime than violent crime (Backman et al., 2015). The connection between lack of sleep and



depression is well-documented. (Voelker, 2004) as is the bi-directionality of the association (Alabri 2015). Our supports support the string of literature that explains stress, sleep disorder, and substance abuse as factors in depression (Voelker, 2004).

Our findings here show that sexual risk behavior may be associated with these other neighborhood disadvantages, whether economic, or environmentally based. Such risk has been associated with social disorder, environment, and social disorganization before (Bowleg et al., 2014). Tobin and colleagues (2012) looked at sex exchange norms and drug use in Baltimore, Maryland, and how it connects to STD and HIV infections. Baltimore ranks as one of the highest cities nationally in sexually transmitted infections and sexually transmitted diseases. Tobin and colleagues (2012) found evidence of a more significant spatial clustering of individuals in low-income areas who report risky sex exchange behavior. This research also suggested a relationship between sexually risky behavior and STD infections. As such, rates of STDs may be a risk marker for other community problems.

Polluting industries are more likely to be located in black neighborhoods than in white communities (Obach, 2013). Thus, air pollution typically affects individuals living in poverty or are disadvantaged. Research suggests that there is a relationship between air pollution (PM 2.5) and increased crime, such as assault and theft (Mapou, 2017). Air pollution in low-income areas creates a hazardous environment for the inhabitants, which causes stress, especially to children growing up in these neighborhoods (Evans et al., 2011). The increased amount of stress and health problems due to air pollution can lead to criminal activity.

Limitations

As with all studies, ours has limitations that must be addressed. First, our data is correlation and, as such, causal conclusions cannot be reached. Second, our first study,



considered data at the county level. However, considerable heterogeneity exists between communities within those counties. This was somewhat accounted for in our second study, which considered zip code level data. Third, our first study examines data which is, fundamentally, bivariate. It is possible that some effects may be spurious and would not be significant in better controlled, multivariate analyses.

Conclusion

In conclusion, our data provide evidence for some economic and social stress indicators that appear to be consistent across four high violent crime cities. These particular factors may be particularly useful for highlighting for public policy efforts, particularly with experimental designs. We hope that our efforts will be a positive contribution to this area.

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