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The associations of area-level crime rates and self-reported crime exposure with adolescent behavioral health

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Abstract:

The effects of witnessing and experiencing crime have seldom been disaggregated. Little research has assessed the effect of multiple exposures to crime. We assess independent contributions of self-reported crime and area-level crime to adolescent behavioral health outcomes.

Cross sectional data on 5,519 adolescents from the Comprehensive Community Mental Health Services for Children and their Families Program was linked to FBI crime rate data to assess associations of mutually exclusive categories of self-reported crime exposure and area-level crime rates with mental health and substance abuse.

Self-reported crime exposure was significantly associated with poorer behavioral health. Violent victimization had the largest association with all outcomes except internalizing scores. All self-reported crime variables were significantly associated with three of the outcomes. Area-level crime rates were associated with one mental health outcome.

Providers should assess direct and indirect crime exposure rather than only focusing on violent victimization.

Keywords: Adolescent; mental health; behavioral health; crime; violence

Direct exposure to violence is associated with adverse mental health and substance abuse outcomes among children and adolescents. Child sexual, physical, and psychological abuse are all associated with adverse behavioral health in adulthood (Senn, Carey, & Vanable, 2010; Springer, Sheridan, Kuo, & Carnes, 2007; Lansford, Dodge, Pettit, & Bates, 2010; Greenfield & Marks, 2010), as are co-occurring childhood adversity and abuse (Kessler, et al., 2010). Current intimate partner violence is associated with substance abuse among adolescents (Temple & Freeman, Jr., 2011; Hanson, et al., 2008). As interpersonal violence increases, so do the odds of behavioral health problems (Hedtke, et al., 2008).

Witnessing violence is also associated with behavioral health outcomes. For example, witnessing intimate partner violence has deleterious behavioral consequences among children (Meltzer, Doos, Vostanis, Ford, & Goodman, 2009; Moretti, Obsuth, Odgers, & Reebye, 2006) and adolescents (Spriggs, Halpern, & Martin, 2009). At the area level, witnessing community violence is associated with adolescent depression (Rosenthal, 2000; Ozer & Weinstein, 2004). However, it is difficult to assess the effects of witnessing violence while excluding effects of direct victimization, as they often co-occur. One study found greater levels of depression and anxiety among urban patients who witnessed violence, but this study was based on adult women and only controlled for one type of violent victimization (Clark, Ryan, Kawachi, Canner, Berkman, & Wright, 2008).

Few studies have examined multiple exposures to violence (poly-victimization), including exposure to community violence, to assess which exposures have stronger associations with outcomes. One meta-analysis found that hearing about and witnessing community violence were associated with post-traumatic stress disorder and witnessing community violence was associated with externalizing symptoms among adolescents (Fowler, Tompsett, Braciszewski, Jacques-Tiura, & Baltes, 2009). Much of the research aggregates the effects of poly-victimization to show that greater exposure to multiple types of violence (including indirect exposure) is associated with poorer mental health (Turner, Shattuck, Finkelhor, & Hamby, 2015). Recent research categorized exposure to a variety of violence types to estimate prevalence and the authors stressed the importance of assessing victimization more completely to better understand the implications of various exposures (Finkelhor, Turner, Ormrod, & Hamby, 2009).

This study uses a comprehensive set of variables to assess whether both types of exposure (direct exposure through victimization and indirect exposure through witnessing violence or knowing someone who was victimized) are independently associated with adverse mental health and substance use outcomes among adolescents. It assesses whether objectively measured area-level crime rates are associated with adolescent behavioral health outcomes, as area- and individual-level exposures could have independent effects (Weich, Blanchard, Prince, Burton, Erens, &

Sproston, 2002). Perhaps just knowing that one lives in a high-crime area leads to adverse behavioral health consequences. Self-reported crime exposure and area-level crime rates have not previously been examined together and the association of area-level crime rates with behavioral health has seldom been examined among adolescents. We hypothesize that behavioral health outcomes will be poorer for adolescents who (1) have self-reported crime exposure, and/or (2) live in areas with higher crime rates.

Methods

Data Sources and Study Sample: Due to increasing awareness of gaps in the provision of children's mental health services, in 1993 the federal government launched the largest children's mental health program to date, the Comprehensive Community Mental Health Services for Children and Their Families Program (SAMHSA (Substance Abuse and Mental Health Services Administration), 2009), also known as the Children's Mental Health Initiative (CMHI). The CMHI's primary goal was to develop systems of care for children with serious mental health problems (Stroul & Friedman, 1994). CMHI funded 173 grantees from 1993 to 2010, including state agencies, counties, territories, tribal organizations, and one school district. Children with serious emotional disturbances are referred from multiple sources (e.g., schools, welfare systems, physicians).

The CMHI collected intake data on seven cohorts of participating children. A subsample of children, known as the longitudinal outcome study sample, has extensive follow-up data collected at six-month intervals. Enrollment in the outcome study was variable; smaller grantees recruited all willing families, whereas larger grantees could opt for sampling strategies. The mix of strategies ensured adequate participation among all grantees. All information was obtained through in-person interviews with youths and their primary caregivers.

We used data from phases 4 (2002 and 2004) and 5 (2005-2006); because instrumentation changed over time, earlier phases could not be combined. Only those enrolled in the complete CMHI dataset (N= 9,265 adolescents) were included. The sample was limited to the adolescents aged 11-18 years old (n=5,519), as they were asked questions about crime exposure in the Youth Information Questionnaire.

CMHI data were linked with Uniform Crime Reporting (UCR) data from the Federal Bureau of Investigations (FBI). These data are voluntarily provided to the FBI by law enforcement agencies across the US (Uniform Crime Reporting Statistics, 2010). UCR data from 2003 to 2008 were used to estimate crime rates at the zip code level and were linked to individuals in the CMHI dataset using residential zip code. Area-level crime

measures were based on violent crimes as defined by the FBI (i.e., murder, non-negligent manslaughter, rape, robbery, and assault).

Dependent Variables: The study outcomes are the internalizing and externalizing scales of the Child Behavior Checklist (CBCL), the Reynolds Adolescent Depression Scale (RADS), and the Global Appraisal of Individual Needs (GAIN) Substance Problems Scale.

The CBCL is a parent questionnaire that has been validated for detecting emotional and behavioral problems among children 6-18 years of age (Achenbach, Manual for the Child Behavior Checklist/4–18 and 1991 profile, 1991). Responses use a three-point Likert scale (0=absent, 1=occurs sometimes, 2=occurs often). The CBCL internalizing scale assesses higher-order factors related to being anxious, depressed, and over-controlled using items from the 'withdrawn,' 'somatic complaints,' and 'anxious/depressed' subscales. The CBCL externalizing scale assesses factors related to being aggressive, hyperactive, noncompliant, and under-controlled, using items from the 'delinquent behavior' and 'aggressive behavior' subscales (Achenbach & Ruffle, 2000). Scores range from 33-91 for internalizing and 33-98 for externalizing, with higher scores meaning more behaviors. T-scores are standardized to have mean equal to 50 and standard deviation equal to 10. T-scores under 60 are in the normal range, t-scores between 60 and 63 are in the borderline range, and t-scores over 63 are in the clinical range (Achenbach, Manual for the Child Behavior Checklist/4–18 and 1991 profile, 1991).

The RADS is a 30-item self-report questionnaire validated for identifying depressive symptoms among adolescents 11-20 years old (Reynolds, 2010). Items assess dysphoric mood, anhedonia/negative affect, negative self-evaluation, and somatic complaints, with responses scored on a four-point scale (1=almost never, 2=hardly ever, 3=sometimes, 4=most of the time). Scores range from 30 to 120, with higher scores meaning more symptoms; severe depression is assessed using a cutoff of 77 or greater (Reynolds, 2010).

The GAIN Substance Problems Scale (Dennis, White, Titus, & Unsicker, 2008) is validated for adolescents aged 10-17 years. It consists of 16 yes/no questions regarding substance use in the previous six months, with higher scores indicating more use. Seven items are from the DSM IV-TR (American Psychiatric Association, 2010) criteria for substance dependence (i.e., tolerance, withdrawal, loss of control, inability to quit, time consuming, reduced activity, continued use despite medical/mental problems), four items assess substance abuse (i.e., role failure, hazardous use, continued use in spite of legal problems, continued use in spite of family/social problems), two items identify substance-induced disorders (i.e., health and psychological disorders), and three items assess lower-severity

symptoms commonly used in screeners (i.e., hiding use, people complaining about use, weekly use). Severity is assessed as low (scores=0), moderate (scores=1-9), or high (scores=10-16).

Independent Variables: Predictors of interest include area-level crime rates and self-reported crime exposure. Area-level crime rates were defined as the zip code level crime rate per 1,000 population, using violent crimes as defined by the FBI.

Self-reported crime exposure is measured using responses to four questions about the respondent's experience with direct and indirect exposure to crime in terms of knowing victims of crime, seeing violent and non-violent crime, and victimization. The following four questions were used to construct this variable (1) In the last 6 months, have you seen any non-violent crime in your neighborhood, such as someone selling drugs or stealing? (2) In the last 6 months, have you seen any violent crimes taking place in your neighborhood, such as someone getting beat up? (3) In the last 6 months, have you known someone other than yourself, who was a victim of a violent crime in your neighborhood? (4) In the last 6 months, have you been a victim of a violent crime in your neighborhood? All four questions used "yes" and "no" as response categories.

We used combinations of responses to create indicators for six mutually exclusive categories: no experience with crime (reference category); has been the victim of violent crime (with or without any other crime exposure); has seen violent crime (with or without seeing non-violent crime) but does not know and was not a victim of violent crime; only crime exposure is having seen non-violent crime; knows a victim of violent crime (with or without seeing non-violent crime), but has not been a victim; and has both seen and known victims of violent crime (but has no other crime exposure). These categories were chosen after examining frequencies of each possible combination of responses and considering whether certain exposures "dominated" others.

Other model covariates were chosen based on previous conceptual model development (Grinshteyn, Eisenman, Cunningham, Andersen, & Ettner, 2016) and published literature including age, sex, race/ethnicity, number of living situation changes, spending time living outside the home, having someone their age to talk to, having an adult to talk to, having someone their age to get help from, having an adult to get help from, gang affiliation, presence of a chronic/recurring health condition, family history of depression, family history of mental illness, family history of substance abuse, caregiver history of depression, caregiver history of mental illness, caregiver history of substance abuse, having enough time to spend with family, having enough money for basic needs, physical abuse history, sexual abuse history, exposure to family violence, and caregiver education.

Categorical responses (except those on Likert scales, which were treated as continuous measures) were turned into mutually exclusive indicator variables with an omitted reference category.

Analyses: The main analysis estimated multivariate linear fixed-effects (FE) regressions using multiply imputed data. Final sample sizes for each outcome were 5,183 for both the internalizing and externalizing CBCL, 4,750 for the RADS, and 4,743 for the GAIN Substance Problems Scale.

To address clustering and the possibility of bias due to potential confounding of site-level heterogeneity (including urbanicity) with predictors of interest, we chose to estimate models using site fixed effects (FE). We considered Generalized Estimating Equations (GEE), multi-level modeling (MLM), and random effects (RE) models. FE models were chosen because profiling geographic areas was not one of the goals of the study and confounding of the predictors of interest with unobserved site-level heterogeneity seemed likely. For example, sites with unmeasured poor access to behavioral health care services, leading to worse behavioral health outcomes, may also be sites with high crime rates. Unlike other methods, the consistency of the FE estimates does not rely on the assumption that unmeasured site heterogeneity is uncorrelated with other model covariates, although the robustness of FE models does come at the expense of some efficiency if such correlation is absent (Ebbes, Böckenholt, & Wedel, 2004; Greene).

Three sensitivity analyses were performed. Zero-inflated negative binomial models were estimated for the GAIN outcome and two-part models were used for all other outcomes instead of linear regression. Results were robust, with trivial changes to effect sizes and significance levels. For brevity and ease of exposition, we report only the results of the main analysis. A final sensitivity analysis removed gang affiliation, as there was concern about over- controlling for the effects of crime.

All analyses were performed using Stata Version 12.1 (StataCorp, 2011). None of the authors have any known conflicts of interest. All authors certify responsibility for the manuscript. UCLA's Institutional Review Board (IRB) approved all research.

Results

Descriptive statistics: The study sample comprised adolescents aged 11-18 years (n=5,519). The sample was 39.1% female and was distributed fairly evenly across age categories. Forty percent identified as white, 30% as black, 18% as Hispanic, 5.2% as multiracial, 3.3% as American Indian/Alaskan Native, 2% as Hawaiian or other Pacific

Islander, and 1.2% as Asian. Over 25% spent time living outside their home, 36% were gang affiliated, and 42% had a chronic physical condition. A majority had a biological family history of depression (69.5%) and alcohol or drug problems (62.7%). Almost half were exposed to family violence. With respect to the variable of interest, self-reported crime exposure, almost half (49.8%) of the sample had no experience with crime, 10.3% were the victim of violent crime, 13.2% had both seen violent crime and knew victims of violent crime, 7.4% knew victims of violent crime, 11.1% had seen violent crime, and 8.3% had seen non-violent crime.

T-scores, which adjust for demographic characteristics and are described above in the methods with respect to relevant cutoffs, are presented for the outcome variables in the descriptive statistics (although raw scores are used as the dependent variables in the multivariate regressions since the regression models adjust directly for demographic characteristics). Mean internalizing and externalizing CBCL scores in this sample were 64.7 (SD=10.3) and 68.64 (SD=9.9), respectively. The mean RADS score was 52.19 (SD=10.36) and the mean GAIN Substance Problems Scale score was 1.56 (SD=3.23).

Regression-Adjusted Associations of Outcomes with Area-Level Crime Rates: RADS score was the only outcome significantly associated with area-level crime rates. After controlling for all other model covariates, an increase of one crime per 1,000 people increased RADS scores modestly, by 0.06 ($p=0.03$). The baseline crime rate has a mean of 13.77 and a standard deviation of 12.06, implying that increasing area-level crime rates by one SD would increase scores by just over a half a point.

Regression-Adjusted Associations of Outcomes with Self-Reported Exposure to Crime: Relative to having no exposure to crime, seeing non-violent crime was associated with an increase of 1.17 points ($p=0.02$) and knowing a victim was associated with an increase of 1.15 points ($p=0.03$) on the internalizing CBCL score ($p=0.01$) after controlling for all other model covariates. Other self-reported crime exposure variables were not significantly associated with changes in internalizing CBCL scores. Self-reported crime exposure had much bigger associations with externalizing behavior. All five self-reported crime exposure variables were associated with increased externalizing scores relative to those with no crime exposure. The largest increase (4.18 points, or almost half of a standard deviation) was associated with being the victim of violent crime, compared with no crime exposure ($p<0.0001$). The next largest effect was a mean increase of 3.42 points among those who had both seen and known victims of violent crime ($p<0.0001$). Externalizing scores were 2.88 points higher ($p<0.0001$) for those who knew

victims of violent crime. Seeing violent and non-violent crime were associated with externalizing scores that were 2.48 ($p<0.0001$) and 2.35 ($p=0.001$) points higher on average, respectively.

All self-reported crime exposure categories were significantly associated with the RADS. The largest association was with being a victim of violent crime, which increased depression scores by an average of 5.13 when compared to those with no exposure to crime ($p<0.0001$). Seeing and knowing victims of violent crime was associated with a 3.46 point increase ($p<0.0001$), seeing non-violent crime was associated with increases of 2.55 points ($p=0.001$), knowing a victim was associated with increases of 2.05 points ($p=0.01$), and seeing violent crime was associated with increases of 2.09 points ($p=0.003$).

All self-reported crime exposure categories were significantly associated with the GAIN. As with the other outcomes, the largest association (1.21 points; $p<0.0001$) was with being the victim of violent crime. Seeing and knowing victims of violent crime was associated with increased GAIN scores of 1.07 ($p<0.0001$), knowing victims of violent crime was associated with increased scores of 0.70 ($p<0.0001$), seeing violent crime was associated with increased scores of 0.51 ($p<0.0001$), and seeing non-violent crime was associated with increased scores of 0.43 ($p=0.01$). Considering the baseline mean was 1.56, even the smallest effect of 0.43 is a substantial change proportionally.

Sensitivity analysis removing gang affiliation from all models resulted in larger effect sizes for most crime experience variables in externalizing CBCL and GAIN models and slightly smaller effect sizes for the RADS model. Results for the internalizing CBCL are similar to those that include gang affiliation. After removing gang affiliation, area-level crime rates achieved significance at the 5% level in the GAIN model.

Discussion

Previous research identified associations between specific types of crime exposures and specific behavioral health outcomes in adolescents. However, studies have not been undertaken to examine multiple types of crime exposure including victimization, witnessing violent and non-violent crime, and knowledge of victimization. In addition, previous research has not examined the independent associations of area-level crime rates and self-reported crime exposure.

Our analyses assessed both objective measures of crime and self-reported crime exposure to determine associations of individual- and area-level exposures with four behavioral health measures among adolescents. All

models controlled for a large number of risk and protective factors in an effort to distinguish the independent associations of the predictors of interest.

Our hypothesis regarding self-reported crime exposure was largely supported whereas our hypothesis regarding area-level crime rates was not. Actual victimization had a much stronger association with outcomes than area-level crime rates, which was only significant in the RADS model. The strongest and most significant association for externalizing CBCL, RADS, and GAIN scores was with being the victim of violent crime but all exposures were associated with worse outcomes. Seeing non-violent crime and knowing a victim of violent crime were associated with internalizing CBCL scores. Exposures are somewhat correlated so estimates may be conservative.

Limitations: These data are cross-sectional so caution must be used in inferring causality. Reporting bias and measurement error should be considered, as self-reported crime exposure relies on respondents' memories and assessment of whether experiences fall into various categories. Measuring area-level crime rates at the zip code level may be too large to accurately capture an effect on respondent outcomes. Research on concordance between parent and child ratings on the CBCL show that concordance is higher for externalizing symptoms than internalizing symptoms (Rey, 1991). Parents likely under-identify internalizing symptoms, as it is easier to notice externalizing symptoms, which could explain the larger number of significant relationships between self-reported crime exposure variables and externalizing CBCL scores. Another concern is that exposures were only assessed within the previous six months. It is possible that unmeasured explanatory variables are omitted from these analyses; however the only omitted variables that would cause a bias (rather than causing a loss of statistical efficiency) are those that simultaneously influence both the outcome and predictors of interest. Finally, the sample represents adolescents with serious emotional challenges so findings may not be generalizable.

Implications: By utilizing a more comprehensive set of variables to assess self-reported crime exposure, this research addresses gaps and expands the base of knowledge regarding adolescents' exposure to crime and associations with behavioral health. According to the Substance Abuse and Mental Health Services Administration (SAMHSA), addressing trauma, resulting in part from exposure to violence, is vital in providing behavioral health services (SAMHSA's Trauma and Justice Strategic Initiative, 2014). SAMHSA's conceptualization of trauma-informed care is defined as realizing the impact of trauma and understanding paths to recovery, recognizing signs in individuals, integrating knowledge in this area within policies, procedures, and practices, and active resistance of re-

traumatization (SAMHSA's Trauma and Justice Strategic Initiative, 2014). Trauma-informed care should occur at all levels from individual treatment to system-level approaches.

Every category of self-reported crime exposure adversely affects externalizing CBCL, RADS, and GAIN scores, yet it is unclear whether providers inquire about crime exposure, especially indirect exposure (i.e., having known or seen victims of violence). Providers should assess crime exposure to better understand factors associated with worse outcomes. Policy could include implementing early interventions targeting those with crime exposure. Crime exposure could be assessed in schools as adolescents spend a large amount of time there, with targeted services provided for those with exposures that are associated with worse outcomes. Finally, area-level crime rates should measure crime in smaller geographic units while future research should include causal studies and those that include a variety of crime exposures.

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