Risk Factors for and Behavioral Consequences of Direct Versus Indirect Exposure to Violence

Gregory M. Zimmerman, PhD, and Chad Posick, PhD

Research suggests that direct exposure (personal victimization) and indirect exposure (witnessing or hearing about the victimization of a family member, friend, or neighbor) to violence are correlated. However, questions remain about the co-occurrence of these phenomena within individuals. We used data on 1915 youths (with an average age of 12 years at baseline) from the Project on Human Development in Chicago Neighborhoods to examine this issue. Results indicated that youths who tended to be personally victimized were also likely to witness violence; conversely, youths who disproportionately witnessed violence were relatively unlikely to experience personal victimization. In addition, direct and indirect exposures to violence were associated with subsequent adverse outcomes in similar ways. The key distinguishing factor was, rather, the cumulative level of violence (both direct and indirect) to which youths were exposed. (*Am J Public Health*. 2016; 106:178–188. doi:10.2105/AJPH.2015.302920)

Exposure to violence refers broadly to direct victimization via intentional or threatened physical harm or indirect witnessing of (or hearing about) the victimization of a family member, friend, or neighbor. Exposure to violence may occur in the home, school, or community, and it includes experiencing and witnessing events such as fights, shootings, and threats to injure.[1] Although exposure to violence is particularly prevalent among youths living in socioeconomically disadvantaged areas,[2–4] nationally representative surveys indicate that up to 60% of all US youths report exposure to some form of violence, either directly or indirectly, in a given year.[1,5] Hence, scholars and policymakers consider exposure to violence a "national epidemic."[6(p28)]

Recognition of the scope of exposure to violence has prompted several research and prevention efforts. A multidisciplinary workshop on exposure to violence was funded by 10 national agencies in 2002,[7] a national task force was launched in fall 2010,[6] and the National Survey of Children's Exposure to Violence (NatSCEV) was initiated in 2007–2008 (and repeated in 2011 and 2014) as part of an ongoing, cross-sectional panel survey.[1] These sources, along with a flourishing number of scholarly studies, have documented an array of correlates of and mental health and behavioral problems associated with direct and indirect exposure to violence.

Correlates of exposure to violence include demographic characteristics (minority race/ethnicity, male gender, older age among youths)[1] and individual or trait differences, such as low self-control or self-regulation,[8] associating with delinquent peers,[9] and unstructured socializing among peers.[10] Relevant family factors include nonintact family structures, low socioeconomic status, residential instability, conflict, and low emotional or social support.[11–14] Neighborhood factors associated with exposure to violence include concentrated disadvantage and a paucity of neighborhood youth services.[3,4,15–17]

Exposure to violence has also been associated with adverse emotional, medical, and sociobehavioral problems. Forms of emotional distress include anger, loss of confidence, and fear.[18] Anxiety, depression, and posttraumatic stress disorder are among the mental health problems associated with exposure to violence.[19–21] Biological maladies include increased heart rate, sleep disturbance, altered endocrine secretion, and stunted pubertal development.[19,22] Sociobehavioral problems include substance use, violence, and suicidal behavior.[23–25]

Although the correlates and consequences of exposure to violence are well documented, little is known about the relationship between direct and indirect exposure to violence. The accumulated research suggests that direct and indirect exposures to violence have a similar set of risk factors and associated behavioral problems.[26,27] However, the majority of studies have focused on either personal victimization or indirect exposure to violence, with few investigations examining these phenomena concurrently. Thus, questions remain as to whether personal victimization and indirect exposure to violence are merely related in the aggregate or whether, and to what extent, they co-occur within the same individuals.

We addressed this issue by examining 3 questions about the relationship between direct and indirect exposure to violence: What is the extent to which the same individuals are particularly vulnerable to direct versus indirect exposures to violence? What are the shared and unique covariates of direct and indirect exposures to violence? Finally, is being differentially vulnerable to direct versus indirect exposures to violence associated with sociobehavioral problems? Next we discuss our rationale for examining differential vulnerability, or susceptibility, to direct versus indirect exposure to violence.

ABOUT THE AUTHORS

Gregory M. Zimmerman is with the School of Criminology and Criminal Justice, Northeastern University, Boston, MA. Chad Posick is with the Department of Criminal Justice and Criminology, Georgia Southern University, Statesboro.

Correspondence should be sent to Gregory M. Zimmerman, PhD, Northeastern University, School of Criminology and Criminal Justice, 417 Churchill Hall, 360 Huntington Ave, Boston, MA 02115 (e-mail: g.zimmerman@neu.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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DIFFERENTIAL SUSCEPTIBILITY TO DIRECT AND INDIRECT EXPOSURE TO VIOLENCE

Qualitative research in disadvantaged neighborhoods, in particular, highlights the role that pervasive violence plays in the lives of youths. For example, Anderson's ethnographic research on the "code of the street" suggests that all youths—even "decent" youths who avoid personal victimization—witness violence in disadvantaged neighborhoods.[28] Anderson argues that parents often influence their children's behaviors but may not influence what their children see or hear. Moreover, young children often avoid personal victimization but readily observe the violent disputes of older adolescents and adults. Related research suggests that mutually reinforcing processes in the residential landscape of underclass neighborhoods (e.g., social and cultural isolation,[29] restricted geographic activity spaces, and cross-cohort socialization[30]) indirectly expose many youths to violence, despite their ability to avoid personal victimization.[31] These studies suggest that many youths may be disproportionately susceptible to indirect exposure to violence as compared with direct, personal victimization.

Research also suggests that there may be differences in the correlates of direct and indirect exposure to violence. For example, unstructured socializing, or time spent with peers in unstructured, unsupervised activities,[10] may be a more proximal risk factor for direct victimization via the removal of social control responses to violence. Similarly, neighborhood social processes such as collective efficacy could have a particularly strong impact on direct victimization by exerting social control responses to violent neighborhood confrontations.[2]

There is also justification for considering differential outcomes among youths who disproportionately experience direct or indirect exposure to violence. For example, Mohammad et al.[20] identified differences in the problems associated with proximal types of direct victimization (e.g., sexual and physical domestic abuse) and those associated with distal types of indirect exposure to violence (e.g., fearing and witnessing community violence). They found that direct victimization was correlated with posttraumatic stress disorder symptomatology, whereas indirect exposure to violence was associated with aggressive behavior. In addition, Franzese et al.[32] found that girls exposed to consistent parental fighting during adolescence were more than twice as likely as girls not exposed to parental fighting to seek mental health treatment during adulthood; adolescent physical abuse, however, was not associated with subsequent help-seeking behaviors.

Despite these findings, empirical examinations of differential vulnerability or susceptibility to direct versus indirect exposure to violence in a single study are sparse. The rationale behind the relative inattention to this issue is twofold. First, few data sets include measures of both direct and indirect exposure to violence (the NatSCEV is a notable exception).[1] Second, statistical techniques for investigating the overlap between direct and indirect exposure to violence are underused. We used an innovative statistical approach based on item-response theory to address these issues in a data set, that of the Project on Human Development in Chicago Neighborhoods, that contains information on both direct and indirect exposure to violence.

METHODS

The Project on Human Development in Chicago Neighborhoods was designed as a hierarchical study of youths residing in urban neighborhoods. The sampling strategy revolved around 343 researcher-defined neighborhood clusters (NCs) constructed from 847 census tracts in Chicago, Illinois, on the basis of geographical boundaries and internal homogeneity (with respect to socioeconomic status and race/ethnicity). The NCs, which averaged 8000 people and were smaller than the 77 community areas in Chicago (averaging 40 000 people), were designed to approximate local neighborhoods.

We used 2 of the project's core components, the Community Survey and the Longitudinal Cohort Study, in our study. In the Community Survey, a 3-stage sampling design was used to select city blocks within the 343 NCs, households within city blocks, and one adult (18 years or older) per household. This design generated a probability sample of 8782 residents throughout Chicago. Project research staff conducted cross-sectional structured interviews with these residents in 1994–1995; the response rate within neighborhood clusters was 78%.[33] As discussed subsequently, the information on neighborhood characteristics used in our study was derived from the Community Survey.

In the Longitudinal Cohort Study, a multistage stratified sampling design was used to select 80 of the 343 NCs from 21 strata according to race/ethnicity (7 levels) and socioeconomic status (3 levels), and a simple random sample of households was selected from these 80 NCs. Within the selected households, infants, children, and adolescents who were within 6 months of their birth or their 3rd, 6th, 9th, 12th, 15th, or 18th birthday (up to 6 months younger or older than their birthday) were identified for inclusion in 7 study cohorts. Our sample was composed of cohort members who were 9 (n = 677), 12 (n = 683), or 15 (n = 555) years of age at baseline; response rates for these cohorts ranged from 72% to 75%.[34]

Information was collected on youths and their primary caregivers via several means, including self-report questionnaires, structured interviews, and research staff observations. Three waves of data were collected approximately 2 years apart (e.g., the age 12 cohort was assessed at 12, 14, and 16 years of age); waves 1, 2, and 3 were administered from 1994 to 1997, 1997 to 2000, and 2000 to 2002, respectively. Retention rates across the cohorts included in our study ranged from 83% to 86% at wave 2 and from 71% to 78% at wave 3. Our final sample consisted of 1915 youths who answered at least one direct and one indirect exposure to violence question at wave 2, representing 28 660 total exposure to violence item responses and 79 neighborhoods.

More than 23% of respondents were missing data owing to lack of a response on at least one of the items focusing on individual-level correlates of exposure to violence (measured primarily at wave 1), and roughly 25% of respondents were missing data due to attrition on one or more of the items focusing on consequences of exposure to violence (measured at wave 3). No detectable patterns emerged between these participants and those with complete data, suggesting that data were missing at random. Nonetheless, to

avoid loss of statistical power and to address potential bias, we used chained equations in Stata version 13 (StataCorp LP, College Station, TX) to impute missing data. Statistical models (described subsequently) were estimated via maximum likelihood in HLM version 7 (Scientific Software International, Skokie, IL), which averaged coefficients and created robust standard errors across the 10 imputed data sets to address model assumption violations.[35–37]

To examine potential bias created by the imputation procedures, we reestimated the models with youths who had complete data or who had missing data on only one variable. A sensitivity analysis of this abbreviated sample of 27 078 items within 1808 individuals representing 79 neighborhoods yielded a pattern of findings identical to that described here.

Measures

Study variables are described briefly in this section. A detailed description of all measures, including means, standard deviations, ranges, and reliabilities (when applicable), as well as the procedures and items used to construct these measures, is provided in Appendix A (available as a supplement to the online version of this article at http://www.ajph.org).

Exposure to violence. Consistent with prior research, 15 items were used to measure exposure to violence in the home, school, or community during the year preceding the wave 2 interview.[15,23,31,38–41] These items were adapted from the Survey of Children's Exposure to Community Violence.[40,42] Respondents reported whether (0 = no, 1 = yes) they were direct victims of 6 acts:

1. being shoved, kicked, or punched;
2. being attacked with a weapon;
3. being shot;
4. being shot at;
5. being chased with intent for injury; and
6. being threatened.

Respondents reported whether they witnessed each of these acts, as well as seeing someone get killed, hearing a gunshot, and finding a dead body. These items capture both more frequent, less serious behaviors and less frequent, more serious behaviors.

Consequences of exposure to violence. Three consequences of exposure to violence were measured at wave 3 of the study: substance use, offending, and suicidal behavior. As a means of assessing substance use, respondents were asked whether (0 = no, 1 = yes) they had consumed alcohol (beer, wine, wine coolers, or liquor), smoked cigarettes, and used marijuana in the preceding year.[43] Offending was measured via summed assessments of youths' self-reported involvement (0 = no, 1 = yes) in 9 violent crimes (e.g., attacking someone with a weapon, using force to rob someone, shooting someone) and 7 property crimes (e.g., breaking into a building, stealing from a store, buying or selling stolen goods) during the preceding year.[44] Following recent consensus on nonfatal suicidal behavior,[45–47] we summed scores from 4 items that focused on whether, during the preceding year, respondents had thought about suicide, thought seriously about suicide often, had an exact plan for suicide, and attempted suicide (0 = no, 1 = yes).

Individual correlates of exposure to violence. We included in our analysis several person-level variables that have been demonstrated as correlates of direct and indirect exposures to violence.[2,8,14,15,26,38] Most variables were measured at wave 1 to preserve proper temporal order with respect to exposure to violence.

Demographic variables included age, gender, race/ethnicity, and immigrant generation status. Family composition was assessed according to parents' marital status and family structure. Household socioeconomic status was constructed from a principal component factor analysis of parental income, education, and occupation.[48] Family support was measured via youths' responses to 5 items from the Provision of Social Relations Protocol.[49] Indices of parental warmth (representing kindness or affection) and parental efficacy (representing control, supervision, and monitoring) were based on 9 and 13 items, respectively, derived from the Home Observation for Measurement of the Environment inventory,[50] designed to capture family dynamics through research staff observations. The analysis also included a measure of residential stability.

Exposure to violent peers was measured via youths' self-reports of how many of their friends engaged in 4 violent acts: getting into a fistfight, hitting someone with the intent of injury, attacking someone with a weapon, and robbing someone with a weapon. As a means of constructing a measure of unstructured socializing, respondents were asked how often they ride around in a car for fun, hang out with friends, go to parties, go out at night, and go out with a date.[10,51,52]

We included 4 individual differences variables in our analysis. Low self-control was measured through parental reports of youths' inhibitory control (e.g., has trouble controlling impulses), present orientation (e.g., often acts on the spur of the moment), sensation seeking (e.g., generally seeks new and exciting experiences and sensations), and low persistence (e.g., generally does not see things through to the end).[17,53,54] Prior offending was measured as youths' self-reported involvement in 6 violent crimes in the year preceding the baseline interview (e.g., attacking someone with a weapon, using force to rob someone).

Street efficacy was constructed as the sum of 5 items based on respondents' self-reported ability to avoid getting into fights in the neighborhood, do things safely in the neighborhood with their friends, avoid gangs in the neighborhood, feel safe in the neighborhood, and go places within a few blocks of home safely.[31,55] As a control for unobserved heterogeneity in exposure to violence preceding measurement of the explanatory variables, 10 items were summed to indicate a youth's lifetime exposure to family, friend, and community violence[40,42] prior to the baseline interview.

We included a pair of additional individual-level control variables. A dummy variable distinguished respondents with complete data from those who had imputed data, and 2 dummy variables accounted for the potential impact of moving within and outside of Chicago between waves 1 and 2 of the study.[56]

Neighborhood correlates of exposure to violence. Our analysis included several neighborhood-level variables that have been demonstrated as relevant to exposure to violence.[2,15,17] Three neighborhood variables were constructed from the 1990 decennial census. Concentrated disadvantage was measured as the weighted factor regression score of 5 items: percentage of families below

the poverty line, percentage of households receiving public assistance, percentage of nonintact families with children, percentage of the population unemployed, and median household income. Residential instability was constructed as the inverse of the standardized sum of the percentage of owner-occupied homes and the percentage of residents living in the same house as 5 years earlier.[57–60] Blau's equation was used in constructing a racial heterogeneity scale.[61,62]

Our analysis also included 2 variables constructed from the 1995 Community Survey. Collective efficacy combined a pair of 5-item scales strongly related across neighborhoods: social cohesion and trust (e.g., this is a close-knit neighborhood, people are willing to help their neighbors) and shared expectations for social control (e.g., neighbors would do something about kids defacing a building or would break up a fight in front of their house).[59] Four items representing lack of a neighborhood youth center, lack of recreation programs outside of school, lack of after-school academic or recreational programs, and lack of mentoring or counseling services (e.g., a big brothers or big sisters program) were used to construct a measure of neighborhood youth organizations.[15]

Statistical Analysis

In our analysis, we used a multilevel, logistic item-response model to nest the 15 dichotomous exposure to violence measures (at level 1) within individuals (at level 2) and within neighborhoods (at level 3). This statistical approach has been used to study specialization in offending (e.g., property vs violent),[63–65] victimization (e.g., violent vs nonviolent),[66] and violent behavior (violence vs suicide).[67] Although this was the most appropriate modeling technique given our focus on intraindividual specialization in exposure to violence, it did involve pooling of the cohorts, implicitly assuming across-cohort consistency in rates of exposure to violence. We addressed this potential concern by controlling for the cohort to which respondents belonged. We also examined the relationships between the model covariates and exposure to violence across cohorts, in essence estimating the model separately for each cohort. The results indicated that there were very few significant differences across cohorts, lending credence to our modeling strategy.

The level 1 regression model had 3 distinguishing features: an intercept (a latent variable representing the average level of exposure to violence in the sample), a series of coefficient parameters capturing the base rates for the 15 item responses through dummy variables representing each item, and a measure of differential susceptibility to direct versus indirect exposure to violence, representing the difference between the odds of being personally victimized and the odds of witnessing violence. A positive value on this measure indicates that an individual is more likely to be personally victimized than to witness violence; a negative value suggests that an individual has a greater tendency to witness than to personally experience violence. It is important to note that, because the level 1 model varied as a function of both item and person parameters, a youth's "score" on exposure to violence was "implicitly" weighted by the seriousness of the items.[68,69]

The level 2 and level 3 models, respectively, allowed for examinations of the individual and neighborhood correlates of overall exposure to violence and differential susceptibility to direct versus indirect exposure to violence. In these models, we allowed the latent variable representing differential susceptibility (derived from the level 1 model just described) to vary randomly across individuals and neighborhoods. We were able to use the variances in these models, with their accompanying tests of statistical significance, to estimate the extent to which differential susceptibility to direct versus indirect exposure to violence varied across individuals and neighborhoods, thus allowing us to examine our first research question.

To examine our second research question, we extended the level 2 and level 3 models to examine the person-level and neighborhood-level factors that distinguish direct and indirect exposure to violence. To investigate our third research question, we examined the bivariate relationships between the consequences of exposure to violence discussed earlier (substance use, offending, and suicidal behavior) and the measure of differential susceptibility to direct versus indirect exposure to violence estimated via the multilevel item-response model.

RESULTS

In the first stage of our analysis, we examined the reliabilities and variances from the 3-level item-response model without covariates. The results discussed in this section are shown in tabular form in Appendix B (available as a supplement to the online version of this article at http://www.ajph.org).

Results from the unconditional item-response model indicate the extent to which individuals are differentially susceptible to direct versus indirect exposure to violence by providing a person-level variance term that statistically tests whether individual differences in differential susceptibility are greater than would be expected by chance. The variance component (1.58) was significant ($P < .001$), indicating that although direct victimization and indirect exposure to violence co-occur within the same individuals, some people are statistically more likely to experience personal victimization than to witness violence, whereas others are statistically more likely to witness violence than to be personally victimized. The neighborhood-level variance term for differential susceptibility was also significant (0.27; $P < .001$), indicating that neighborhood characteristics can contribute to an understanding of individual differences in susceptibility. In addition, the person-level ($\tau = 2.55$; $P < .001$) and neighborhood-level ($\tau = 0.18$; $P < .001$) variance components for overall exposure to violence were significant, indicating variation across individuals and neighborhoods.

The unconditional item-response model also provided person-level reliability estimates, which indicate the precision of the latent measures of overall exposure to violence and differential susceptibility to direct versus indirect exposure to violence. The reliability for the measure of overall exposure to violence, 0.73, was above the conventional standard (0.70) for internal consistency. The reliability for the measure of differential susceptibility was markedly lower, 0.30, reflecting the limited information available in individuals' responses, an element taken into account in the item-response-based approach.[63,66] The neighborhood-level reliability estimates (0.52 for overall tendency and 0.52 for differential susceptibility) were comparable to those

observed in neighborhood-level models in prior research.[69]

Level of Differential Susceptibility

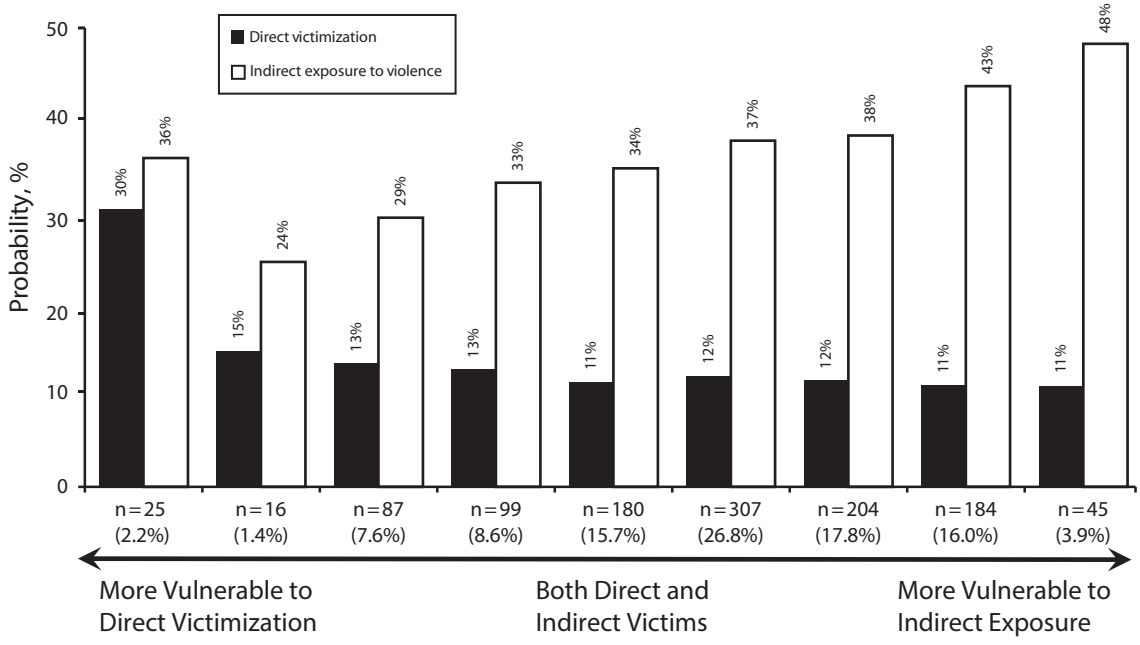
Figure 1 graphically illustrates the observed probabilities of experiencing (one or more episodes of) direct and indirect exposure to violence along a continuum representing a respondent's level of differential susceptibility to direct versus indirect exposure. Recall that this measure of differential susceptibility is a continuous, latent variable assigned according to the item-response model. Because youths exposed to 0 or 1 violent act cannot by definition contribute reliably to the differential susceptibility variable, the figure is based on respondents who experienced 2 or more of the 15 exposure to violence events, constituting 59.9% of the 1915 youths in the sample.

The figure indicates that the youths most vulnerable to direct victimization (those toward the left side of the figure) have high levels of direct victimization (30%) but are also exposed to secondary violence at relatively high rates (36%). As one moves to the right of the figure, vulnerability to indirect exposure to violence, as compared with direct victimization, increases. Consequently, the probability of indirect exposure to violence increases, and the probability of direct victimization decreases. Indeed, at the far right of the figure, youths have high levels of indirect exposure to violence (48%) but relatively low levels of direct victimization (11%). In short, Figure 1 suggests that youths who are personally victimized at high rates are also at high risk of witnessing violence, but youths who witness violence at high rates are not necessarily at high risk for experiencing personal victimization.

Correlates of Differential Susceptibility

Table 1 shows the correlates of (the latent variables representing) the overall tendency toward exposure to violence and differential susceptibility to direct versus indirect exposure to violence. The table presents odds ratios (i.e., exponentiated log-odds regression coefficients) and 95% confidence intervals for the person- and neighborhood-level covariates. The results indicate that the following groups had increased odds of exposure to violence: male youths, Hispanic youths, third-generation immigrants (as compared with first-generation immigrants), older respondents, respondents with higher levels of unstructured socializing, respondents living in neighborhoods with higher levels of disadvantage and a paucity of youth services, and respondents with lower levels of self-control, lower levels of street efficacy, and higher levels of violent offending. Also, it is noteworthy that prior exposure to violence was one of the strongest correlates of subsequent exposure to violence; controlling for this lagged measure of exposure to violence yielded conservative estimates for the other covariates.

Referring to the differential susceptibility model, the outcome is a continuous latent variable. Higher values on this variable represent a greater vulnerability to direct victimization as compared with indirect exposure to violence, and lower values represent an increased vulnerability to indirect as compared with direct exposure. Therefore, explanatory variables with odds ratios above 1



Note. The x-axis representing a respondent's level of differential susceptibility ranges from 2 standard deviations below to 1.5 standard deviations above the mean of the differential susceptibility variable.

FIGURE 1—Observed Probabilities of Experiencing (1 or More Episodes of) Direct and Indirect Exposure to Violence Among Participants Aged 9–15 Years: Project on Human Development in Chicago Neighborhoods; Chicago, IL; 1997–2002

TABLE 1—Results of Hierarchical Item-Response Regression of Overall Tendency Toward Exposure to Violence and Differential Susceptibility to Direct Versus Indirect Exposure to Violence on Independent Variables: Project on Human Development in Chicago Neighborhoods; Chicago, IL; 1994–2000

Independent Variable	Overall Tendency, OR[a] (95% CI)	Differential Susceptibility, OR[b] (95% CI)
Demographic characteristics		
Male	1.25*** (1.13, 1.39)	0.94 (0.82, 1.09)
Race/ethnicity[c]		
Hispanic	1.31** (1.08, 1.60)	1.10 (0.81, 1.49)
Black	1.20 (0.99, 1.45)	1.43* (1.01, 2.05)
Immigrant generation[d]		
First	0.72*** (0.61, 0.85)	0.83 (0.63, 1.10)
Second	0.86 (0.72, 1.03)	0.87 (0.70, 1.07)
Age cohort[e]		
Age 12 y	1.26*** (1.11, 1.43)	1.32** (1.11, 1.56)
Age 15 y	1.33*** (1.14, 1.56)	1.34** (1.10, 1.64)
Family factors		
Parents married	0.89 (0.72, 1.09)	0.98 (0.68, 1.40)
Family structure[f]		
1 parent, not biological	0.77 (0.54, 1.11)	0.62 (0.36, 1.05)
1 parent, biological	1.05 (0.82, 1.34)	0.86 (0.58, 1.27)
2 parents, 1/both not biological	0.98 (0.80, 1.20)	0.86 (0.67, 1.10)
Household socioeconomic status	1.03 (0.97, 1.11)	0.87** (0.80, 0.96)
Years living at residence	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)
Family support	0.99 (0.95, 1.05)	0.97 (0.90, 1.04)
Parental warmth	0.98 (0.93, 1.04)	0.98 (0.91, 1.06)
Parental efficacy	0.99 (0.94, 1.04)	0.92* (0.89, 0.98)
Peer association variables		
Exposure to violent peers	1.04 (0.97, 1.11)	1.00 (0.92, 1.09)
Unstructured socializing	1.41*** (1.33, 1.50)	1.08* (1.01, 1.16)
Individual differences variables		
Low self-control	1.09** (1.02, 1.15)	0.95 (0.88, 1.02)
Violent offending	1.18*** (1.10, 1.26)	0.96 (0.88, 1.04)
Street efficacy	0.83*** (0.79, 0.88)	0.95 (0.88, 1.04)
Lifetime exposure to violence	1.38*** (1.29, 1.48)	1.12* (1.03, 1.22)
Control variables		
Moved within Chicago, waves 1–2	1.00 (0.90, 1.12)	0.74*** (0.63, 0.88)
Moved out of Chicago, waves 1–2	0.87 (0.72, 1.05)	0.60** (0.42, 0.86)
Imputed data[g]	0.89 (0.78, 1.01)	1.16 (0.96, 1.40)
Neighborhood variables		
Neighborhood disadvantage	1.11** (1.04, 1.20)	1.29*** (1.15, 1.45)
Concentrated immigration	1.01 (0.93, 1.10)	1.05 (0.91, 1.21)

Continued

can be interpreted as having a stronger relationship with direct victimization, those with odds ratios below 1 can be interpreted as having a stronger relationship with indirect exposure to violence, and those with odds ratios close to 1 (and nonsignificant) can be interpreted as having similar effects on direct and indirect exposure to violence.

Factors having a stronger relationship with direct victimization include demographic characteristics (Black race, older age), unstructured socializing with peers, and neighborhood variables (concentrated disadvantage, paucity of youth services). For example, the odds ratio of 1.29 for neighborhood disadvantage indicates that a 1-standard-deviation increase in neighborhood disadvantage increases the odds of direct versus indirect exposure to violence by 29%. Thus, living in a neighborhood with high levels of concentrated disadvantage increases risk of direct exposure to violence more than risk of indirect exposure. Variables having a stronger relationship with indirect exposure to violence include family factors (household socioeconomic status, parental efficacy) and residential mobility (moving both within and outside of Chicago across study waves). Thus, youths residing in households with lower levels of socioeconomic status and parental efficacy and those whose families recently moved were at greater risk for indirect than direct exposure to violence.

Consequences of Differential Susceptibility

Figures 2 and 3 display levels of substance use, offending, and suicidal behavior (during the year preceding wave 3) across 4 categories of youths. The "low ETV" category consists of youths who responded affirmatively to 0 or 1 of the 15 exposure to violence (ETV) items. Respondents who responded affirmatively to at least 2 of the 15 items were categorized as direct victims, indirect victims, or both direct and indirect victims.

We used person-specific scores on the latent variable representing differential susceptibility to direct versus indirect exposure to violence (assigned according to the multilevel item-response model) to construct these categories. Direct victims were classified as those whose differential susceptibility score exceeded +1 standard deviation, whereas indirect victims were classified as those whose differential susceptibility score fell below −1 standard deviation; individuals with scores between +1 and −1 were classified as both direct and indirect victims. These threshold values were adopted from prior research in

TABLE 1—*Continued*

Residential instability	1.02 (0.93, 1.11)	1.00 (0.89, 1.12)
Collective efficacy	1.01 (0.92, 1.10)	1.07 (0.94, 1.22)
Paucity of youth services	1.09** (1.04, 1.15)	1.14** (1.04, 1.25)

Note. CI = confidence interval; OR = odds ratio. The level 1 model produced relative severities for the 15 exposure to violence items. Also, the model controlled for "other" race and for cases with missing data. A total of 28 660 exposure to violence item responses were gathered from 1915 respondents residing in 79 neighborhoods.

[a]Represents the change in odds in the dependent variable associated with a 1-unit change in the independent variable. Values above 1 represent a positive association with overall tendency toward exposure to violence. Values below 1 represent a negative association with overall tendency toward exposure to violence.

[b]Represents the change in odds of the difference between direct victimization and indirect exposure to violence associated with a 1-unit change in the explanatory variable. Explanatory variables with odds ratios above 1 can be interpreted as having a stronger relationship with direct victimization than with indirect exposure to violence, those with odds ratios below 1 can be interpreted as having a stronger relationship with indirect exposure to violence, and those with odds ratios close to 1 (and nonsignificant) can be interpreted as having similar effects on direct and indirect exposure to violence.

[c]Reference category: White.

[d]Reference category: third (or higher) generation.

[e]Reference category: age cohort 9 y.

[f]Reference category: 2 parents, both biological.

[g]This variable indicates that data were imputed for 1 or more independent variables for a given sample youth.

*$P < .05$; **$P < .01$; ***$P < .001$ (2-tailed test).

which this item-response-based statistical approach was used,[63,66] but experimentation with alternative threshold values yielded the same substantive pattern of results as that described here.

Figure 2 displays the results for substance use. Youths infrequently exposed to violence (the low ETV category) had significantly lower rates of alcohol, cigarette, and marijuana use than youths in each of the 3 categories of differential susceptibility. In the case of 2 of the 3 substances considered (alcohol use and marijuana use), however, rates of substance use were statistically indistinguishable across the 3 categories of differential susceptibility.

Figure 3 displays the results for offending and suicidal behavior. Youths in the low ETV category had significantly lower rates of violent and property offending and suicidal behavior than youths in each of the 3 categories of differential susceptibility. In addition, the percentages of respondents engaging in property offending and suicidal behavior were statistically indistinguishable across the 3 categories of differential susceptibility.

In short, Figures 2 and 3 suggest that the critical difference is whether individuals are exposed to some form of violence. The type of violence exposure (indirect vs direct) appears to have less of an impact than whether and to what extent violence occurs. Ultimately, being exposed to violence has an array of negative behavioral consequences regardless of the type of violence to which youths are exposed.

DISCUSSION

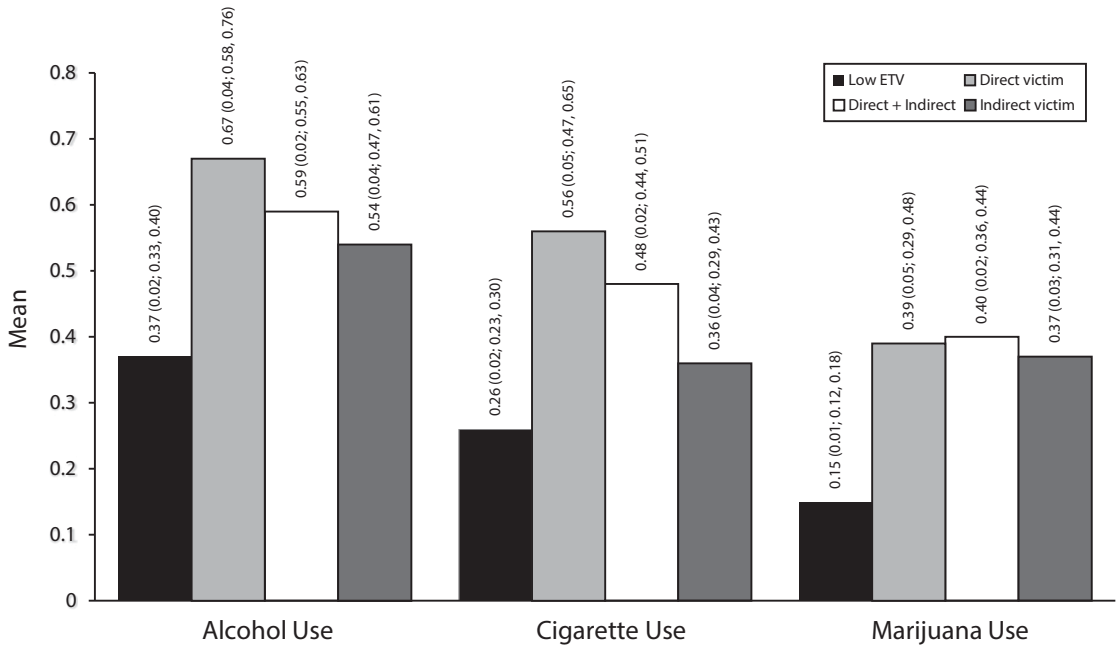
In this study of youths residing in Chicago neighborhoods, we used an innovative statistical approach based on item-response theory to answer 3 questions about the relationship between direct and indirect exposure to violence: What is the extent to which the same individuals are particularly vulnerable to direct versus indirect exposures to violence? What are the shared and unique covariates of direct and indirect exposures to violence? And is being differentially vulnerable to direct or indirect exposures to violence associated with sociobehavioral problems?

With respect to the first question, the findings indicated that youths who tended to be personally victimized were also at high risk for witnessing violence but that those who witnessed violence at high rates were relatively unlikely to be personally victimized. From a research perspective, these findings should influence how we think about multiple or co-occurring exposure to violence. For example, the findings suggest that youths, on average, tend to be exposed to violence either generally (as both a direct victim and a witness) or indirectly (as a witness); very infrequently are youths exposed solely to direct victimization.

With respect to the second question, certain factors influenced overall exposure to violence (both direct and indirect). Beyond demographic characteristics, the most salient individual-level correlates of overall exposure to violence included unstructured socializing with peers, low levels of self-control, a violent history, and a low perceived ability to avoid neighborhood violence. Previous exposure to violence also emerged as a salient correlate of subsequent exposure, suggesting a cycle of victimization that is independent of other risk factors. Neighborhood factors associated with exposure to violence included neighborhood disadvantage and a paucity of neighborhood youth services.

A number of factors also affected direct and indirect exposure to violence to varying degrees. For example, unstructured socializing was associated with both direct and indirect exposure to violence, but youths with high levels of unstructured socializing were more likely to experience violence directly than indirectly. Similarly, concentrated disadvantage and a paucity of neighborhood youth services increased the odds of experiencing both direct and indirect victimization but were more strongly related to direct victimization than to indirect exposure to violence. Thus, one might expect the lack of appropriate social control responses to violent behavior associated with unstructured socializing and concentrated disadvantage to affect both direct and indirect exposure to violence, albeit more strongly with respect to direct victimization.

Conversely, family factors (household socioeconomic status, parental efficacy, residential instability) had a stronger relationship with indirect exposure to violence. Thus, one might expect a lack of (economic and emotional) resources in these families to cause parental fighting (that youths witness in the home) or prevent involvement in after-school programs that reduce exposure time for



Note. Bars indicate mean (SE; 95% confidence interval). For alcohol use and marijuana use, the low ETV category was statistically lower ($P < .001$) than each of the 3 categories of differential susceptibility, but there were not significant differences across the 3 categories of differential susceptibility. For cigarette use, the low ETV category was significantly lower ($P < .001$) than each of the 3 categories of differential susceptibility, the indirect category was significantly lower ($P < .01$) than the direct and direct + indirect categories, and the direct and direct + indirect categories were statistically indistinguishable. Significance tests are based on results from χ^2 analysis.

FIGURE 2—Relationships Between Differential Susceptibility to Direct vs Indirect Exposure to Violence (ETV) at Wave 2 and Percentages of Respondents Engaging in Substance Use During the Year Preceding Wave 3: Project on Human Development in Chicago Neighborhoods; Chicago, IL; 1997–2002

witnessing community violence. In essence, the results suggest that there are both complementary and competing effects pertaining to the correlates of direct versus indirect exposure to violence, according to which some variables have an impact on both direct and indirect exposure to violence but appear to be more salient correlates of one type of exposure to violence than the other.

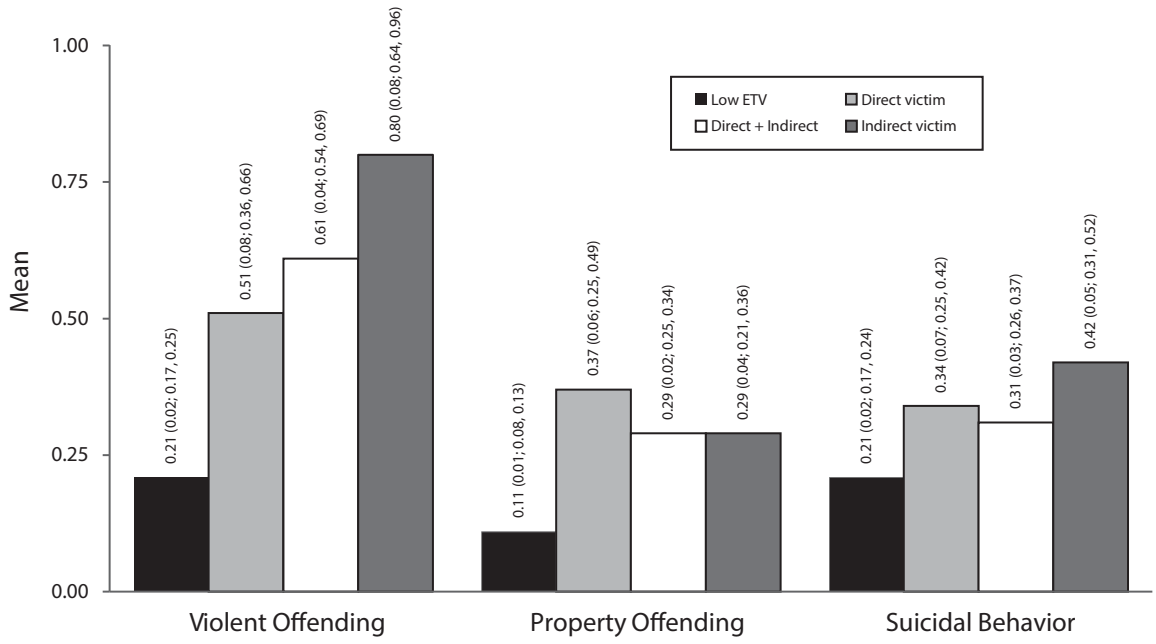
In terms of the third question, the results indicated that levels of substance use, offending, and suicidal behavior did not significantly vary across type of exposure to violence (direct vs indirect). That is, direct and indirect exposures to violence were (statistically) equally as harmful with respect to the outcomes considered. Instead, the critical difference appeared to be the cumulative level of violence (both direct and indirect) to which youths were exposed. This finding suggests that exposure to violence, regardless of the type of exposure (indirect or direct) or the type of violence (being hit or hearing a gunshot), can have an array of adverse, debilitating sequelae.

Implications for Violence Prevention and Remediation

There are 3 key lessons from our study findings. First, a large number of US youths witness and hear about violence in their homes and communities, and a subset of these youths also experience high levels of personal victimization. From a public health perspective, these results suggest a dual-tiered prevention and intervention approach. Broad-spectrum initiatives in schools and communities should promote strategies to avoid violent situations and to cope with secondary exposure to violence.[55] Concurrently, identifying youths exposed to multiple forms of violence is paramount, given that children exposed to one type of violence are at increased risk of experiencing other types of violence[5] and that developmental problems increase exponentially when youths are exposed to multiple forms of violence.[70] Rapid identification of these youths involves educating the public about how to identify youths exposed to violence, and to whom to refer these youths, and educating professionals to recognize and address the needs of youths exposed to violence.[6]

Second, risk factors can affect both direct and indirect exposure to violence, but to varying degrees. Addressing exposure to violence as a whole requires a multisystemic approach that targets risk factors in family, peer, and community contexts.[71] This is consistent with the conclusion of the Attorney General's National Task Force on Children Exposed to Violence that combating exposure to violence requires both facilitating safe, nurturing, nonaggressive home environments and rebuilding communities plagued by violence.[6] It also speaks to the need to coordinate screening and prevention efforts across sectors, including child-care providers, child welfare agencies, schools, hospitals, community outreach organizations, and the juvenile justice system.[1]

In addition, the overwhelming similarity between the correlates of (overall) exposure to violence and violent behavior itself, an overlap well documented in the literature,[48,72] suggests that combating exposure to



Note. Bars indicate mean (SE; 95% confidence interval). For violent offending, the low ETV category is significantly lower ($P < .001$) than each of the 3 categories of differential susceptibility, the indirect category is significantly higher ($P < .05$) than the direct and direct + indirect categories, and the direct and direct + indirect categories are statistically indistinguishable. For property offending and suicidal behavior, the low ETV category is significantly lower ($P < .001$) than each of the 3 categories of differential susceptibility, but there are no significant differences across the 3 categories of differential susceptibility. Significance tests are based on results from Kruskal–Wallis analysis.

FIGURE 3—Relationships Between Differential Susceptibility to Direct vs Indirect Exposure to Violence (ETV) at Wave 2 and Mean Numbers of Violent Offenses (out of 9 Items), Property Offenses (out of 7 Items), and Suicidal Behaviors (out of 4 Items) During the Year Preceding Wave 3: Project on Human Development in Chicago Neighborhoods; Chicago, IL; 1997–2002

violence requires a simultaneous focus on reducing violent offending among US youths.[73] This is particularly important given that violent offending predicts subsequent exposure to violence, and victims and witnesses of violence often become violent offenders at a later time point.[73,74]

In terms of the risk factors that had different effects on direct and indirect exposure to violence, our findings suggest that indirect exposure to violence may be particularly sensitive to the family environment, a context in which warmth, communication, and supervision can play pivotal roles in reducing secondary exposure to violence. Also, prevention efforts aimed at reducing direct victimization should focus particular attention on the peer and community contexts in which youths live and act. One suggestion is to introduce and encourage participation in neighborhood youth organizations. Such organizations aim to provide youths with productive outlets during nonschool hours[75] and safe environments in which to socialize and improve their academic achievement,[15] thereby reducing exposure to contexts that facilitate violence.

Third, exposure to violence is harmful regardless of whether youths witness violence or are personally victimized. Youths who witness and experience violent victimization are at risk for internalizing problems (e.g., suicidal ideation), detrimental coping strategies (e.g., substance use), self-directed violent behavior (e.g., attempted suicide), property offending, and interpersonal violence. Given that exposure to violence, regardless of the type of exposure (indirect or direct), has an array of maladaptive developmental outcomes, researchers and practitioners should consider screening for a broader range of exposures, including emotional, physical, and psychological abuse and violence in the family, school, peer group, and community.[1]

Limitations

Despite its strengths, our study does have limitations. First, the data we used are approximately 20 years old. Although we might not expect time to affect variables that change gradually (e.g., neighborhood disadvantage), some societal changes could influence the relative contributions of our covariates to direct versus indirect exposure to violence. For example, increases in the share of officially recorded violent crime attributable to female offenders over recent decades[76] could affect gender differences in exposure to violence or the relationships between associating with deviant peers and direct and indirect exposure to violence. In addition, the time of our data collection predated certain technological advances (e.g., text messaging) potentially pertinent to the avoidance of direct or indirect exposure to violence. Care must therefore be taken in generalizing our results.

Second, we did not consider all forms of victimization (e.g., childhood abuse and neglect) or distinguish family, school, and community victimization. Heterogeneity in the results according to type of violence is therefore possible.[77]

Third, Figures 2 and 3 illustrated the bivariate relationships between a respondent's differential susceptibility to direct versus indirect exposure to violence and substance use, offending, and suicidal behavior. However, we cannot establish causation without using modeling techniques that take into account possible confounding variables and lagged measures of the outcomes. We therefore recognize the potentially problematic nature of referring to the outcome variables as "consequences" of exposure to violence. Nonetheless, the fact that exposure to violence was measured for the year before wave 2, temporally prior to the outcomes (which were measured for the year preceding wave 3), gives us confidence in the causal order of our variables.

Conclusions

With these limitations in mind, we conclude by reaffirming the key insight that direct and indirect exposures to violence are prevalent among today's youths. We also encourage future scholarly activity to focus on exposure to violence in totality, given that the cumulative level of violence to which youths are exposed (both direct and indirect), rather than the type of exposure (direct vs indirect), may be the determining factor with respect to adverse developmental outcomes later in the life course. AJPH

CONTRIBUTORS

G. M. Zimmerman originated the article, conducted the statistical analyses, and drafted the article. C. Posick drafted the discussion and reviewed the article.

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HUMAN PARTICIPANT PROTECTION

In this study, we used restricted secondary data from the Project on Human Development in Chicago Neighborhoods. The study was approved by the Northeastern University institutional review board and by the Interuniversity Consortium for Political and Social Research at the University of Michigan.

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