

Is Exposure to Violence a Persistent Risk Factor for Offending across the Life Course? Examining the Contemporaneous, Acute, Enduring, and Long-term Consequences of Exposure to Violence on Property Crime, Violent Offending, and Substance Use

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Abstract

Objectives: To examine the contemporaneous (cross-sectional), acute (1 year), enduring (5–7 years), and long-term (12–13 years) effects of exposure to violence on offending behaviors. **Methods:** We analyze four waves of

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data from the National Longitudinal Study of Adolescent to Adult Health ($N = 7,706$). Exposure to violence captures direct (interpersonal victimization and violent threats) and indirect (witnessing violence) experiences with violence. Outcome measures include property crime, violent offending, and substance use. A series of logistic regression models examine the acute, enduring, and long-term effects of exposure to violence on the offending outcomes at each study wave, controlling for exposure to violence, lagged dependent variables, and baseline covariates at all previous waves. *Results:* The effects of exposure to violence on violent offending persist over time, with effects attenuating over time. However, exposure to violence only has contemporaneous and acute effects on property crime and drug use. *Conclusions:* Long-term effects of exposure to violence on violent offending are not an artifact of confounding with more recent experiences with violence. Both distal and proximate effects of exposure to violence should be addressed in order to adequately disrupt the overlap between exposure to violence and violent offending.

Keywords

exposure to violence, offending, victim-offender overlap

Exposure to violence is a particularly consequential aspect of youths' reality. The concept of exposure to violence is multidimensional, referring broadly to: (1) direct interpersonal victimization and threatened physical harm or (2) the indirect witnessing of (or hearing about) violence (Buka et al. 2001; Eitle and Turner 2002; Jonson-Reid 1998; Richters and Martinez 1993). Exposure to violence may occur in the home, school, peer group, or broader community; and it includes experiencing and witnessing violent events ranging from less serious, more prevalent acts (e.g., fighting) to more serious, less prevalent acts (e.g., sexual victimization and shootings; Fagan, Wright, and Pinchevsky 2014; Finkelhor et al. 2009).

Research has documented the high prevalence of both direct and indirect exposure to violence (Buka et al. 2001; Fagan et al. 2014; Richters and Martinez 1993). By recent estimates, over 60 percent of children under the age of 17 are exposed to violence, either directly or indirectly, each year in the United States (Finkelhor et al. 2009). According to the National Survey of Children's Exposure to Violence (Finkelhor et al. 2013), approximately 26.4 percent of youths aged 10 to 13 years and 42.6 percent of youths aged 14 to 17 years witnessed violence in the family or in the community in

2010; and 46.5 percent and 39.5 percent of youths aged 10 to 13 years and 14 to 17 years, respectively, were physically assaulted in the past year. The high prevalence of exposure to violence prompted the Attorney General's National Task Force on Children Exposed to Violence—an interagency and interdisciplinary collaborative of researchers and practitioners in the United States—to deem exposure to violence a “national epidemic” (Listenbee and Torre 2012:28).

The high prevalence of exposure to violence is particularly alarming given evidence of its severe consequences. Exposure to violence has been associated with: negative emotionality, including anger, loss of confidence, and fear (Posick 2014); mental health issues, such as anxiety, post-traumatic stress disorder, and depression (Borowsky et al. 2001; Brown et al. 1999; Buka et al. 2001; Cuevas et al. 2010); negative biological responses, such as impaired cognitive functioning, increased heart rate, sleep disturbance, and stunted pubertal development (Fowler et al. 2009; Mohammad et al. 2015; Perkins and Graham-Bermann 2012); and adverse behavioral outcomes, including substance use, suicidal behavior, aggression, and crime (Brezina et al. 2004; Cleary 2000; Nofziger and Kurtz 2005; Pinchevsky, Wright, and Fagan 2013; Zimmerman, Farrell, and Posick 2017). Both victimization and witnessing violence are documented correlates of a wide range of maladaptive internalized and externalized outcomes (Buka et al. 2001; Eitle and Turner 2002; Fagan et al. 2014).

Exposure to Violence as a Cause of Subsequent Offending

Of particular import to the current study is the widely documented relationship between exposure to violence and offending, a phenomenon commonly referred to as the victim-offender overlap (Fagan et al. 2014; Farrell and Zimmerman 2017; Jennings, Piquero, and Reingle 2012; Muftić, Finn, and Marsh 2015; Tomsich et al. 2017). In a review of 37 studies that examine the victim-offender overlap, Jennings and colleagues (2012) found that 84 percent demonstrated a significant association between victimization and offending. Studies indicate that victims and offenders share similar demographic characteristics (e.g., young, unmarried males; Lauritsen, Sampson, and Laub 1991); that victims frequently report prior contact with the criminal justice system; and that offenders often report prior victimization experiences (Widom 1989). Scholars have thus argued that victims and offenders are often the same persons (Hindelang 1976; Wolfgang 1957).

Yet, theory as to the causal relationship between exposure to violence and offending remains unclear. One perspective theorizes that exposure to violence and offending are not causally related but are instead simply co-occurring phenomena (Gottfredson and Hirschi 1990; Hindelang 1976; Piquero et al. 2005). In this case, similar variables (e.g., low self-control and demographic characteristics) explain both exposure to violence and offending independently. A second perspective advocated by routine activities theorists posits that offending increases one's vulnerability to exposure to violence because offenders' risky lifestyles expose them to more deviant people and places (Lauritsen and Laub 2007). Finally, stress-response theories such as general strain theory (Agnew 2001) suggest that offending is a maladaptive coping strategy or reaction to a serious or traumatic strain in one's life, such as exposure to violence (Agnew 1992). In this case, exposure to violence is perceived as unjust and high in magnitude (Agnew 2001), incentivizes crime as a negative coping technique via social learning (Agnew 2001; Anderson 1999), and creates pressure for corrective action, including: escape-avoidance (e.g., substance use), compensation (e.g., property crime), or retaliation (e.g., violent offending; Agnew 1992). In this study, we examine exposure to violence as a risk factor for subsequent offending, grounded in Agnew's (2001) general strain theory.

A wealth of prior work has examined the effects of direct, personal victimization on offending outcomes (Fagan et al. 2014; Jennings et al. 2012; Tomsich et al. 2017); and an emerging area of inquiry has focused on the relationship between indirect exposure to violence and offending, given that youths are two to four times more likely to witness violence than to be personally victimized (Richters and Martinez 1993). Both victimization and indirect exposure to violence have been documented as correlates of a wide variety of offending behaviors. There is evidence that victimization increases the likelihood of conduct disorder in childhood and adolescence (McCabe et al. 2005), violent offending in adolescence and adulthood (Apel and Burrow 2011; Eitle and Turner 2002; Jennings et al. 2012; Shaffer and Ruback 2002), property crime (Daday et al. 2005; Farrell and Zimmerman 2017; Tyler and Melander 2015), gang membership (Apel and Burrow 2011), and substance use (Browning and Erickson 2009; Farrell 2017). Similarly, indirect exposure to violence has been linked to aggression (McCabe et al. 2005), violent behavior (Fagan et al. 2014; McCabe et al. 2005), property crime (Zimmerman and Posick 2016), and substance use (Fagan et al. 2014; Kilpatrick et al. 2000).

Recent research has also begun to examine contingencies in the relationship between exposure to violence and offending. For example, prior

research using the Add Health data has focused on heterogeneity in the types of victimization that lead to offending, including violent victimization (Matjasko et al. 2010), physical abuse (Savage, Palmer, and Martin 2014), and sexual victimization (Farrell 2017). Additionally, research has examined: whether the relationship between victimization and offending is attenuated when the victim has a strong social support network (Fagan et al. 2014); whether the strength of the relationship between exposure to violence and offending depends on repeat victimization, poly-victimization, and heterogeneity in the types of exposure to violence (Farrell and Zimmerman 2017); and whether the victim-offender overlap is a product of socialization or selection bias (Tomsich et al. 2017). In short, there is ample evidence that: (1) both direct and indirect exposure to violence predict a wide range of subsequent offending behaviors; and (2) that the relationship between exposure to violence and offending is not constant; rather, it hinges on a number of factors, including the type of victimization and offending, the repeat nature of victimization, and the context in which the violence occurs.

The Long-term Effects of Exposure to Violence on Offending

Despite the accumulated evidence on the relationship between exposure to violence and subsequent offending, much of the existing literature has focused on contemporaneous and acute (i.e., short-term) effects, while few studies have examined the relationship between exposure to violence and offending across a longer period of the life course, spanning at least 15 years and at least three developmental time periods (e.g., childhood, adolescence, and adulthood). Moreover, most longitudinal studies on this topic have focused on determining the causal order between exposure to violence and offending rather than on examining whether, and to what extent, this relationship persists over time (Halliday-Boykins and Graham 2001; Jennings et al. 2010). And, most existing examinations of the long-term effects of exposure to violence on offending have utilized retrospective data collection techniques, in which lifetime exposure status and offending outcomes are ascertained retroactively (Briere and Runtz 1990; Maniosky-Rummell and Hansen 1993).

Retrospective studies introduce several potential biases, including unmeasured confounding factors and measurement error via recall bias, particularly when retrospective questions pertain to incidents over a long period of time (Lynch and Addington 2010; Malinosky-Rummell and

Hansen 1993). Even the life-event calendar (LEC) method, designed to facilitate memory recall through cognitive response behavior tools such as bounding cues and sequencing (Sutton 2010), underestimate significant life events. Roberts and colleagues (2005), for example, found significant underreporting of violent events when using retrospective questioning via the LEC method, in comparison with prospective interview data collected one to three years earlier on the same sample. In addition, psychological research on memory indicates that individuals are better at remembering more recent events (recency effect), as compared to events that occurred in a distal past (Glenberg et al. 1980; Maughan and Rutter 1997), making retrospective questioning challenging, relatively unreliable, and often inaccurate (invalid; Malinosky-Rummell and Hansen 1993).

In response to the concerns with retrospective study designs, a small number of studies examining the long-term impact of exposure to violence have utilized prospective data collection techniques. For example, Maxfield and Widom (1996) used a prospective cohort design that matched childhood cases of abuse and neglect to controls and collected data on juvenile and adult criminality 22 to 26 years later. Results indicated that childhood victims of abuse and neglect were significantly more likely to have a juvenile or adult record for both nontraffic offenses and violent crime by age 32. Menard (2002) used nine waves of prospective, longitudinal data from the National Youth Survey spanning adolescence (11–17 years in 1976) to adulthood (27–33 years in 1992). Results indicated that violent victimization during adolescence (i.e., intentional or threatened robbery, assault, assault with a weapon, or sexual victimization) increased the odds of domestic violence perpetration, violent offending (felony assault), and property offending (felony theft) by approximately 75 percent, 254 percent, and 188 percent, respectively, in adulthood.

While informative, prior research examining the long-term impact of exposure to violence has tended to measure exposure to violence at a single, discrete time point in the past rather than to account for subsequent experiences with violence prior to the measurement of the dependent variable by incorporating repeated measures of exposure to violence. This is problematic in several respects. First, behavior at time point t is one of the best predictors of behavior at subsequent time points ($t + 1$ and $t + 2$; Mischel 1968). This is particularly true for exposure to violence, which is often a repeat occurrence rather than an isolated event. For example, research indicates that 30 percent of first-time victims are victimized at least one more time throughout their lives (Turner, Finkelhor, and Ormrod 2010). Consequently, evidence of long-term effects of exposure to violence may

simply be an artifact of confounding with more recent experiences if these recent experiences go unmeasured (Davis 1985). Additionally, individuals tend to be influenced by more recent events as compared to distal events (a recency effect; Glenberg et al. 1980; Maughan and Rutter 1997). Therefore, neglecting to account for more recent experiences with violence may result in biased (overestimated) estimates of the long-term effects of exposure to violence (VanderWeele, Jackson, and Li 2016).

These methodological concerns align with two key assertions of general strain theory. First, the duration (or expected duration) of strain matters: repeated strains, and those that persist over time, increase the likelihood of maladaptive coping responses to negative emotional states (Agnew 1992). Second, grounded in psychological research on memory (Maughan and Rutter 1997), general strain theory suggests that more recent strain-inducing events are more consequential than past events (Agnew 1992). Understanding the full extent of strain's consequences thus requires measuring strain at multiple time points. Accordingly, we measure exposure to violence and offending at four time points in order to understand their contemporaneous, short-term, and long-term relationships. As enumerated in the Current Study section below, we hypothesize that the impact of exposure to violence on offending will persist over time, but that recent experiences with violence will be more influential than distal experiences.

We also stress that it is impossible to determine whether outcome behaviors are long-term consequences of a distal experience with violence *or* short-term responses to ongoing or recent exposure to violence if recent exposure to violence is unaccounted for statistically (Malinosky-Rummell and Hansen 1993:77). Given the frequency of repeat victimization (Turner et al. 2010) and the risk of overestimating long-term effects when more recent incidents of exposure to violence are not captured (VanderWeele et al. 2016), it is critical to take a dynamic theoretical and analytical approach rather than a static approach (Brame, Bushway, and Paternoster 1999). The latter treats exposure to violence as a time-stable tendency to commit crime, which (1) leads to the problematic assumption that early exposure to violence establishes a propensity to offend that endures (Brame et al. 1999), and (2) suggests that only cross-sectional data are needed to understand the relationship between exposure to violence and offending, contrary to the assertions of general strain theory as noted above (Agnew 1992). We utilize a dynamic approach by measuring exposure to violence and offending across four time points that span 13 years. Doing so recognizes the critical component of time in the general strain theory framework

and allows for the examination of long-term effects, net of new instances of exposure to violence (Collins 2006; VanderWeele et al. 2016).

In short, we draw upon key insights from general strain theory (Agnew 1992) and research on causal inference in longitudinal research (VanderWeele et al. 2016) to disentangle the short- and long-term effects of exposure to violence on offending (Malinosky-Rummell and Hansen 1993). Specifically, we analyze four waves of data from the National Longitudinal Study of Adolescent to Adult Health (Add Health) to examine the contemporaneous (cross-sectional), acute (after 1 year), enduring (after 5–7 years), and long-term (after 12–13 years) effects of exposure to violence on violent offending, property crime, and substance use. We enumerate our expectations below.

Current Study

As discussed above, the accumulated evidence indicates that exposure to violence is strongly associated with maladaptive behavioral outcomes, including violent offending, property crime, and substance use (Apel and Burrow 2011; Browning and Erickson 2009; Daday et al. 2005; Eitle and Turner 2002; Farrell and Zimmerman 2017; Jennings et al. 2012; Shaffer and Ruback 2002; Tyler and Melander 2015). Yet much of the research on the overlap between exposure to violence and offending has measured exposure to violence and offending cross-sectionally at a single time point or longitudinally at two consecutive and proximal time points, thereby restricting exposure to violence and its consequences to a single developmental time period. Long-term assessments of exposure to violence on offending are sparse and have not adequately accounted for recent experiences with violence when assessing long-term effects.

Addressing these gaps in the literature, our study examines the effects of exposure to violence on violent offending, property crime, and substance use across four different time points. Given evidence of the debilitating sequelae of exposure to violence (Borowsky et al. 2001; Brezina et al. 2004; Buka et al. 2001; Perkins and Graham-Bermann 2012), we expect exposure to violence to have immediate, acute, enduring, and long-term effects on violent offending, property crime, and substance use (Hypothesis 1). Yet, psychological research on recency effects suggests that recent events are easier to recall and therefore more impactful than distant events (Maughan and Rutter 1997). Research also suggests that the time lapse between experiencing stressful events (e.g., exposure to violence) and maladaptive coping responses (e.g., offending behaviors) through negative

emotionality may be quite short, and recent events may be more consequential than older events (Agnew 1992). Finally, prior research provides preliminary evidence that the relationship between exposure to violence and delinquency may diminish over time (Fagan 2003). We therefore expect to observe persistent but attenuated effects of exposure to violence on violent offending, property crime, and substance use over time (Hypothesis 2). We test our hypotheses with four consecutive waves of data spanning 13 years from the Add Health.

Method

Data and Participants

Add Health collected data from a nationally representative sample of 7th- to 12th-grade students in the United States in the middle 1990s and then followed these respondents over time (Harris et al. 2009). The initial sampling frame for the Add Health study was created in 1994 to 1995 from a list of 26,666 U.S. middle and high schools maintained by Quality Education Data, Inc. in Denver, CO. A stratified sample of 132 middle and high schools was selected from this frame with probability of selection proportional to school size; schools were representative on size, type, geographic region, urbanization, and racial composition (Kalsbeek, Yang, and Agans 2002). The first survey was conducted within schools and included questionnaires related to personal and family demographics, school achievement, risky health behaviors, mental health, and physical health. A total of 90,118 students were surveyed during this wave with a response rate of 79 percent.

The first in-home survey was conducted in 1995 and interviewed 20,745 students selected from school rosters using a stratified sampling design based on grade and sex, resulting in a response rate over 80 percent. All wave 1 respondents were eligible for participation in all subsequent waves: 14,738 respondents (88.6 percent response rate), 15,170 respondents (77.5 percent response rate), and 15,701 respondents (75.7 percent response rate) were reinterviewed at wave 2 (1996), wave 3 (2001–2002), and wave 4 (2008), respectively (Chen and Chantala 2014). Over 10,000 respondents ($N = 10,120$) took part in all four waves of data collection. All data were collected using laptops and sensitive questions were read by the respondent to ensure confidentiality and limit interviewer influence.

Of the 10,120 participants who took part in all four waves of data collection, 1,937 were missing data on one of the dependent variables in this

study ($N = 698$) or missing valid sampling weights ($N = 1,239$) and were removed. Of the remaining 8,183 participants eligible for our study sample, 477 (5.8 percent) had missing data on one or more independent variables and were removed from the sample. Our final study sample consists of 7,706 adolescents and young adults who: were interviewed at all four waves of data collection, had valid sampling weights, and had complete information on the dependent variables (offending), key independent variables (exposure to violence), and baseline covariates. There were no detectable patterns between respondents in our final study sample and respondents who were lost to missing data or to missing sampling weights, suggesting that data were missing at random. Most notably, there were not statistically significant differences between respondents in our final study sample and respondents lost to missing data or to missing sampling weights with respect to our key independent variables (exposure to violence) and dependent variables (property crime, violence, and substance use) at each study wave.

Measures

Offending outcomes. Offending was self-reported by respondents at each of the four waves of data collection. Property crime measures whether or not (0 = no; 1 = yes) participants engaged in one or more of the following acts in the year preceding each interview: deliberately damaged property, stole something worth more than US\$50, entered a building or house to steal something, or stole something worth less than US\$50. Approximately 31.0 percent ($N = 2,392$), 24.5 percent ($N = 1,889$), 15.1 percent ($N = 1,166$), and 8.1 percent ($N = 620$) of respondents reported engaging in one or more property crimes during the year preceding waves 1, 2, 3, and 4, respectively. The decrease in property crime over time is consistent with prior research using the Add Health data (Daigle, Beaver, and Hartman 2008). The distribution and lack of variability in the summative measures of property crime justify the strategy to dichotomize the measures. As discussed in the Analytical Strategy section below, property crime measured at each study wave serves as the dependent variable in a logistic regression model, while lagged measures of property crime at all prior waves are included as covariates.

Violent crime measures whether or not (0 = no; 1 = yes) participants engaged in one or more of the following offenses during the year preceding each study wave: used or threatened to use a weapon to get something, took part in a group fight, pulled a knife or gun on someone, shot or stabbed someone, or got into a serious physical fight. Approximately 38.1 percent

($N = 2,938$), 27.6 percent ($N = 2,127$), 12.5 percent ($N = 962$), and 7.7 percent ($N = 594$) of respondents reported engaging in one or more violent behaviors during the year preceding waves 1, 2, 3, and 4, respectively. Based on prior research using the Add Health data, we expected this decrease in violent offending over time (Daigle et al. 2008). Well over 90 percent of respondents reported zero violent crime at wave 4, justifying the measurement strategy. As discussed in the Analytical Strategy section below, violent offending measured at each study wave serves as the dependent variable in a logistic regression model, while lagged measures of violent offending at all prior waves are included as covariates.

Substance use measures whether or not (0 = no; 1 = yes) respondents got drunk during the year preceding each interview or used at least one of the following substances in the month preceding each interview: cigarettes, marijuana, cocaine, methamphetamines, heroin, lysergic acid diethylamide (LSD), phencyclidine (PCP), ecstasy, mushrooms, or inhalants. Approximately 32.9 percent ($N = 2,539$), 39.8 percent ($N = 3,065$), 47.5 percent ($N = 3,659$), and 44.4 percent ($N = 3,424$) of sample respondents reported using one or more of the above substances at waves 1, 2, 3, and 4, respectively. The increase in substance use across study waves is consistent with prior research using the Add Health data (Needham 2007). As with property crime and violent offending, substance use measured at each study wave serves as the dependent variable in a logistic regression model, while lagged measures of substance use at all prior waves are included as covariates. We recognize that our measure of substance use includes drugs that differ in terms of their legality, severity, and frequency of use; we therefore discuss and examine potential variation among drinking, smoking, marijuana use, and illicit drug use in the Supplemental Analysis section below. All descriptive statistics are displayed in Table 1.

Exposure to violence. At each wave of the Add Health study, respondents were asked whether in the past year they: were shot by someone, were cut or stabbed by someone, got jumped (the definition of “got jumped” was not provided in the survey), had a knife or gun pulled on them, or saw someone get shot or stabbed by another person. We measure exposure to violence as whether or not participants responded affirmatively to one or more of the five items at each wave of data collection. Approximately 22.7 percent ($N = 1,752$), 17.3 percent ($N = 1,332$), 9.3 percent ($N = 718$), and 10.3 percent ($N = 794$) of respondents reported being exposed to violence at waves 1, 2, 3, and 4, respectively. Regarding exposure to violence at multiple time points, 21.6 percent ($N = 1,662$) of respondents reported exposure to

Table 1. Descriptive Statistics for Study Variables ($N = 7,706$).

Variables	Mean (%)	SD (n)	Min.	Max.
Offending outcomes				
Wave 1 property crime	31.0	2,392		
Wave 1 violent offending	38.1	2,938		
Wave 1 substance use	32.9	2,539		
Wave 2 property crime	24.5	1,889		
Wave 2 violent offending	27.6	2,127		
Wave 2 substance use	39.8	3,065		
Wave 3 property crime	15.1	1,166		
Wave 3 violent offending	12.5	962		
Wave 3 substance use	47.5	3,659		
Wave 4 property crime	8.1	620		
Wave 4 violent offending	7.7	594		
Wave 4 substance use	44.4	3,424		
Exposure to violence variables				
Wave 1 exposure to violence	22.7	1,752		
Wave 2 exposure to violence	17.3	1,332		
Wave 3 exposure to violence	9.3	718		
Wave 4 exposure to violence	10.3	794		
Baseline study covariates				
Male	45.6	3,512		
Race or ethnicity				
White (reference)	57.6	4,436		
African American	19.7	1,568		
Hispanic	15.2	1,173		
Other	7.5	581		
Age at wave 1	15.2	1.5	11	21
Impulsivity	8.8	2.5	4	20
Depression	10.9	7.4	0	51
Two biological parents	57.9	4,458		
Parental education	43.1	3,319		
Public assistance	9.5	730		
Parental bonds	3.9	0.9	1	5
School bonds	2.3	0.7	1	5
Neighborhood bonds	9.3	2.5	6	18

Note: Means and standard deviations are presented for interval and continuous variables. Percentages and number of respondents are presented for categorical variables. Age was grand mean centered and impulsivity, depression, and neighborhood bonds were standardized prior to analysis. SD = standard deviation; Min. = minimum; Max. = maximum.

violence at only one wave of the study, 11.2 percent ($N = 865$) of respondents reported exposure to violence at two time points, 3.9 percent ($N = 304$) of respondents reported exposure at three study waves, and 1.0 percent ($N = 73$) of respondents reported exposure at all four study waves. The prevalence of repeat exposure to violence necessitates controlling for exposure to violence at one time point when accurately examining the effects of exposure to violence at previous time points. We discuss the analytical strategy in the Statistical Methods section below. We also consider the effects of poly-victimization in the Supplemental Analysis section below.

Individual differences. Our statistical models (discussed below) control for three demographic variables: biological sex, race or ethnicity, and age, all assessed at wave 1 of the study. Roughly 45.6 percent of participants were male ($N = 3,512$). Approximately 57.6 percent ($N = 4,436$), 19.7 percent ($N = 1,568$), 15.2 percent ($N = 1,173$), and 7.5 percent ($N = 581$) of respondents self-identified as White, African American, Hispanic, and “Other,” respectively. On average, participants were 15.2 years at wave 1 (standard deviation = 1.5; range = 11–21). At waves 2, 3, and 4, respondents were on average 16 years (standard deviation = 1.5; range = 11–23), 21 years (standard deviation = 1.6; range = 18–27), and 28 years (standard deviation = 1.6; range = 24–33), respectively.

We also account for individual differences through impulsivity and depression, measured at wave 1 of the study. Impulsivity is a summative scale based on four attitudinal-based statements self-reported from 1 = strongly agree to 5 = strongly disagree: (1) when you have a problem to solve, one of the first things you do is get as many facts about the problem as possible, (2) when you are attempting to find a solution to a problem, you usually try to think of as many different ways to approach the problem as possible, (3) when making decisions, you generally use a systematic method for judging and comparing alternatives, and (4) after carrying out a solution to a problem, you usually try to analyze what went right and what went wrong. These items generated a reliable scale ($\alpha = .75$), consistent with prior research (Baker 2010; Remster 2014). On average, respondents reported low levels of impulsivity (8.8 on a scale from 4 to 20).

Depression was measured using 19 items from the Center for Epidemiologic Studies Depression scale (Watts and McNulty 2013). Items asked respondents about depressive symptoms in the week preceding the wave 1 interview (e.g., did you feel depressed? and did you feel too tired to do things?). Item responses, which ranged from 0 = never or rarely to 3 = most

of the time or all of the time, were summed ($\alpha = .89$). On average, individuals in the sample exhibited low levels of depression (10.9 on a scale from 0 to 51).

Family factors. Our models include four family-level covariates assessed at wave 1 of the study: family structure, parental education, whether or not a family utilized public assistance, and parental bonds. Family structure is a dichotomous variable indicating whether or not participants lived with both of their biological parents. Roughly 57.9 percent of participants ($N = 4,458$) lived with both biological parents. Parental education is a dichotomous variable indicating whether one or both of a respondents' parents received a college education. Approximately 43.1 percent of participants ($N = 3,319$) had at least one parent with a college education. Participants reported whether or not each parent receives public assistance. Approximately 9.5 percent of participants ($N = 730$) had at least one parent who received public assistance. We measure parental bonds by averaging two items that asked participants on a scale from 1 (not close at all) to 5 (very close): (1) how close do you feel to your [father figure] and (2) how close do you feel to your [mother figure]? (Craig 2016). On average, participants reported being close to their parents (3.9 on a scale from 1 to 5).

School and neighborhood bonds. We account for school and neighborhood context by including measures of school and neighborhood bonds, assessed at wave 1 of the study. School bonds is a summative scale based on a participant's level of agreement (from 1 = "strongly agree" to 5 = "strongly disagree") to five items: (1) you feel close to people at your school, (2) you feel like you are part of your school, (3) you are happy at your school, (4) the teachers at your school treat students fairly, and (5) you feel safe at your school ($\alpha = .76$; O'Neil 2016). On average, participants reported being moderately bonded to their school (2.3 on a scale from 1 to 5).

Neighborhood bonds is a summative scale based on a participant's level of agreement to six items: (1) you know most of the people in your neighborhood, (2) in the past month, you have stopped on the street to talk with someone who lives in your neighborhood, (3) people in this neighborhood look out for each other, (4) do you usually feel safe in your neighborhood? (5) on the whole, how happy are you with living in your neighborhood? and (6) if, for any reason, you had to move from here to some other neighborhood, how happy or unhappy would you be? The first four items had binary (true or false or yes or no) response choices, and the latter two items were rated on a scale from 1 = "not at all" or "very unhappy" to 5 = "very much"

or “very happy.” All items were coded so that higher values represented stronger neighborhood bonds. The items were then standardized (as a result of scale variation across items) and summed ($\alpha = .59$). On average, respondents rated neighborhood bonds as low (9.3 on a scale from 6 to 18).

Analytical Strategy

The analysis proceeds in three stages. First, we regress the dichotomous wave 1 offending outcomes (property crime, violent offending, and substance use) on wave 1 exposure to violence and the study covariates measured at baseline. The results from the logistic regression models, as presented in Table 2, include odds ratios and 95 percent confidence intervals, as well as fully standardized effect sizes. Fully standardized effects in logistic regression (coefficients that are standardized on both the independent and dependent variables) can be interpreted as the predicted standard deviation increase in the log odds of offending for a one standard deviation increase in the independent variables. While this interpretation is not intuitive for binary variables, such as exposure to violence, it allows us to determine the relative explanatory power of our independent variables within each model (Long and Freese 2014).

The first stage of analysis produces contemporaneous effects of exposure to violence on the offending outcomes, as shown in panel A of Figure 1. In the second stage of analysis, we examine and compare the acute (after 1 year), enduring (after 5–7 years), and long-term (after 12–13 years) effects of exposure to violence on the offending outcomes. Panels B through D in Figure 1 illustrate the modeling strategy to obtain these effects. Figure 1, and our general modeling strategy, follows VanderWeele and colleagues (2016), as discussed below.

A number of analytical techniques can be used to model longitudinal relationships using multiple discrete measurement states. For example, repeated-measures marginal structural models are frequently used to assess the direct and indirect effects of time-varying treatments or exposures on an outcome (VanderWeele 2009). While VanderWeele and colleagues (2016) discuss this and other suitable approaches for drawing causal inferences from longitudinal data with exposures that vary over time, they stress that the analytical strategy must match the research question and theoretical framework, as well as the practical considerations of the available data (see also Collins 2006). Because the goal of the current study is to understand the long-term effects of exposure to violence on offending, net of more recent experiences with violence, standard regression approaches are suitable for

Table 2. The Contemporaneous Relationships between Wave 1 Exposure to Violence and Wave 1 Property Crime, Violent Offending, and Substance Use, Controlling for the Baseline Study Covariates ($N = 7,706$).

Independent Variables	Property Crime			Violent Offending			Substance Use		
	OR	95% CI	bStdXY	OR	95% CI	bStdXY	OR	95% CI	bStdXY
Exposure to violence	2.32***	[1.95, 2.76]	0.18	4.64***	[3.85, 5.58]	0.30	2.93***	[2.42, 3.54]	0.21
Male	2.03***	[1.77, 2.33]	0.17	2.30***	[1.97, 2.69]	0.20	1.04	[1.33, 1.49]	0.01
Race or ethnicity ^a									
African American	0.63***	[0.49, 0.80]	-0.08	1.58***	[1.28, 1.97]	0.08	0.40***	[0.32, 0.52]	-0.15
Hispanic	1.16	[0.87, 1.56]	0.02	0.94	[0.70, 1.26]	-0.01	0.67*	[0.46, 0.98]	-0.04
Other	1.14	[0.89, 1.44]	0.02	1.32*	[1.04, 1.67]	0.04	0.70*	[0.51, 0.97]	-0.05
Age	0.93**	[0.89, 0.98]	-0.06	0.85***	[0.81, 0.88]	-0.12	1.41***	[1.33, 1.49]	0.26
Impulsivity	1.10***	[1.07, 1.13]	0.12	1.04**	[0.95, 0.99]	0.05	1.07***	[1.04, 1.10]	0.07
Depression	1.31***	[1.21, 1.40]	0.13	1.37***	[1.26, 1.48]	0.14	1.24***	[1.14, 1.35]	0.10
Two biological parents	1.41***	[1.17, 1.70]	0.09	1.13	[0.96, 1.32]	0.03	0.77**	[0.63, 0.93]	-0.06
Parental education	1.23**	[1.07, 1.42]	0.05	0.70***	[0.60, 0.81]	-0.08	0.95	[0.80, 1.12]	-0.01
Public assistance	0.81	[0.66, 1.01]	-0.03	1.26	[0.99, 1.60]	0.03	0.90	[0.72, 1.12]	-0.02
Parental bonds	0.70***	[0.64, 0.77]	-0.18	0.89*	[0.81, 0.98]	-0.06	0.71***	[0.64, 0.78]	-0.16
School bonds	1.11**	[1.04, 1.19]	0.05	1.18***	[1.08, 1.28]	-0.08	1.42***	[1.31, 1.54]	0.16
Neighborhood bonds	1.00	[0.97, 1.01]	-0.02	0.97**	[0.95, 0.99]	-0.05	0.97*	[0.95, 1.00]	-0.04
Intercept	0.56	[0.26, 1.18]	—	3.56***	[1.88, 6.76]	—	0.00***	[0.00, 0.01]	—

Note: OR = odds ratio; CI = confidence interval; bStdXY = fully standardized coefficient.

^aReference category = White.

* $p < .05$. ** $p < .01$. *** $p < .001$.

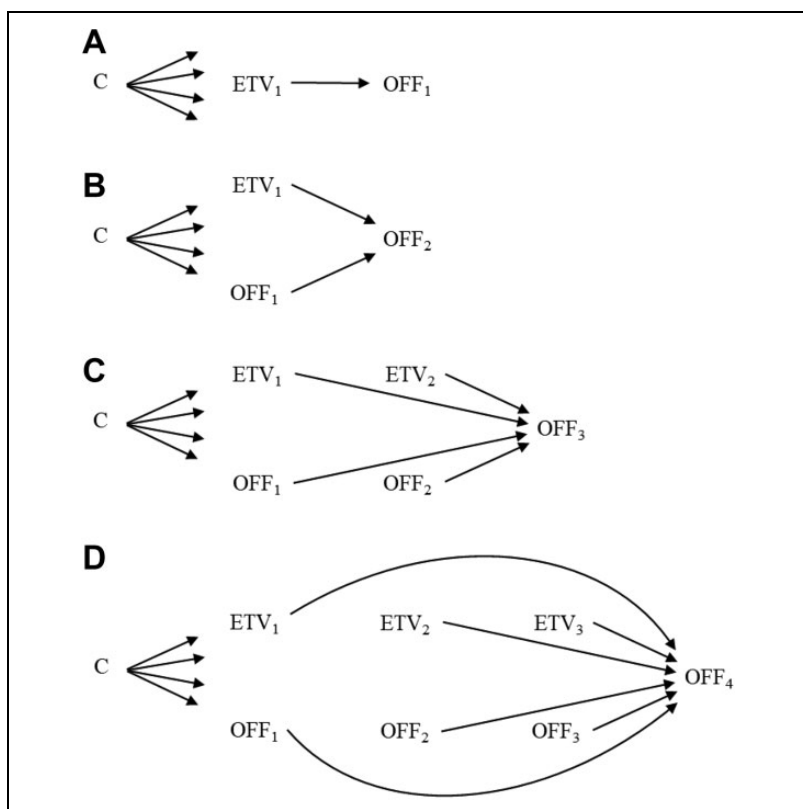


Figure 1. Models illustrating the effects of exposure to violence (ETV), lagged dependent variables (OFF), and the baseline study covariates (C) on W_1 to W_4 offending. Panel A: Contemporaneous effect of W_1 exposure to violence on W_1 offending, controlling for baseline covariates. Panel B: Acute effect of W_1 exposure to violence on W_2 offending, controlling for W_1 offending and baseline covariates. Panel C: Enduring effects of W_1 and W_2 exposure to violence on W_3 offending, controlling for W_1 and W_2 offending and baseline covariates. Panel D: Enduring effect of W_3 exposure to violence and long-term effects of W_1 and W_2 exposure to violence on W_4 offending, controlling for W_1 – W_3 offending and baseline covariates.

our purposes (VanderWeele et al. 2016). Yet, in such instances, VanderWeele and colleagues (2016:1459) stress the importance of controlling for both prior instances of the exposure (i.e., exposure to violence) *and* all prior values of the outcome “to try to rule out reverse causation.” As illustrated in Figure 1, we estimate three series of regression models (one for each

offending outcome) that control for exposure to violence and lagged offending at all prior waves. Following VanderWeele and colleagues (2016), this strategy allows us to reliably estimate the acute, enduring, and long-term effects of exposure to violence on offending.

More specifically, we regress the wave 2 offending outcomes on wave 1 exposure to violence, wave 1 offending, and the baseline study covariates (see panel B in Figure 1). In these models, the odds ratios for wave 1 exposure to violence represent the acute effects of exposure to violence on property crime, violent offending, and substance use. We then regress the wave 3 offending outcomes on waves 1 and 2 exposure to violence, waves 1 and 2 offending, and the baseline study covariates (see panel C in Figure 1). In these models, the odds ratios for waves 1 and 2 exposure to violence represent the enduring effects of exposure to violence on the offending outcomes after five and six years, respectively. Finally, we regress the wave 4 offending outcomes on: waves 1, 2, and 3 exposure to violence; waves 1, 2, and 3 offending; and the baseline study covariates (see panel D in Figure 1). In these models, the odds ratios for waves 1 and 2 exposure to violence represent the long-term effects of exposure to violence on the offending outcomes after 12 and 13 years, respectively; and the odds ratios for wave 3 exposure to violence represent a third enduring effect. Modeled in this manner, we generate one acute effect, three enduring effects, and two long-term effects of exposure to violence on the offending outcomes. In accounting for more recent exposure to violence when examining the effects of more distal experiences with violence, our analytical strategy allows us to reliably estimate acute, enduring, and long-term effects of exposure to violence. Moreover, by controlling for offending at all previous study waves, we avoid producing biased estimates via reverse causation (VanderWeele et al. 2016). We also conduct a series of adjusted Wald comparison tests to assess whether the magnitude of the effects of exposure to violence on offending differs significantly across time frames (e.g., acute vs. enduring effects).

In the third stage of analysis, we conduct supplemental analyses in which we (1) disaggregate the substance use outcome into smoking cigarettes, getting drunk, smoking marijuana, and using illicit drugs and (2) examine the effects of exposure to one versus more than one type of violence on the outcomes, providing a preliminary test of the effects of poly-victimization of offending. Given the dichotomous nature of the dependent variables, all of the models are logistic regression models. All continuous variables were either grand mean centered or standardized to facilitate interpretation of the intercept.

Results

Establishing a Baseline

Table 2 examines the contemporaneous relationships between wave 1 exposure to violence and the wave 1 offending outcomes, controlling for the array of baseline study covariates. Odds ratios (or exponentiated log-odds regression coefficients) and 95 percent confidence intervals, as well as fully standardized coefficients ($bStdXY$), are shown in the table. The results indicate that wave 1 exposure to violence was positively and significantly associated with wave 1 property crime ($OR = 2.32, p < .001$), wave 1 violent offending ($OR = 4.64, p < .001$), and wave 1 substance use ($OR = 2.93, p < .001$). The odds ratios suggest that individuals who were exposed to at least one violent act during the year preceding the wave 1 interview were 132 percent $[(2.32 - 1) \times 100 \text{ percent}]$, 364 percent $[(4.64 - 1) \times 100 \text{ percent}]$, and 193 percent $[(2.93 - 1) \times 100 \text{ percent}]$ more likely to engage in wave 1 property crime, violent offending, and substance use than were individuals who were not exposed to violence.

With respect to the demographic characteristics, the results indicate that: males were more likely to engage in property crime ($OR = 2.03, p < .001$) and violence ($OR = 2.30, p < .001$) than were females, African American respondents were less likely than White respondents to engage in property crime ($OR = 0.63, p < .001$) and substance use ($OR = 0.40, p < .001$) but more likely to engage in violent offending ($OR = 1.58, p < .001$), Hispanic respondents were less likely to engage in substance use ($OR = 0.67, p < .05$) than were White respondents, and older respondents, as compared to younger respondents, were less likely to engage in property crime ($OR = 0.93, p < .01$) and violent offending ($OR = 0.85, p < .001$) but more likely to engage in substance use ($OR = 1.41, p < .001$). Pertaining to the individual differences: impulsivity was positively associated with property crime ($OR = 1.10, p < .001$), violent offending ($OR = 1.04, p < .001$), and substance use ($OR = 1.07, p < .001$); depression was positively associated with all three offending outcomes ($OR = 1.31, p < .001$ for property crime; $OR = 1.37, p < .001$ for violent offending; and $OR = 1.24, p < .001$ for substance use).

Individuals living with two biological parents were less likely to engage in substance use ($OR = 0.77, p < .01$) than were youths residing in nonintact families, but youth from intact families were more likely to engage in property crime ($OR = 1.41, p < .001$); individuals with at least one parent with a college education were more likely to engage in property crime ($OR = 1.23, p < .01$) but less likely to engage in violent offending

($OR = 0.70, p < .001$); and receiving public assistance was not significantly related to any of the offending outcomes. With respect to youths' bonds to their parents, to school, and to their neighborhoods: Parental bonds were inversely associated with property crime ($OR = 0.70, p < .001$), violent offending ($OR = 0.89, p < .05$), and drug use ($OR = 0.72, p < .001$); school bonds were positively associated with property crime ($OR = 1.11, p < .01$), violent offending ($OR = 1.18, p < .001$), and drug use ($OR = 1.42, p < .001$); and neighborhood bonds were inversely associated with violent offending ($OR = 0.97, p < .01$) and drug use ($OR = 0.97, p < .05$).

Table 2 also presents bStdXY. While the interpretation of standardized effect sizes is not intuitive for binary variables, such as exposure to violence, they allow us to determine the relative explanatory power of our independent variables within each model. The standardized coefficients for exposure to violence (.18 for property crime, .30 for violent offending, and .21 for substance use) indicate that exposure to violence is one of the strongest, if not the strongest correlate of each of the offending behaviors.

Examining the Contemporaneous, Acute, Enduring, and Long-term Effects of Exposure to Violence on the Offending Outcomes

Table 3 examines the contemporaneous (cross-sectional), acute (after 1 year), enduring (after 5–7 years), and long-term (after 12–13 years) effects of exposure to violence on the offending outcomes measured across the four study waves. Although the results pertaining to the study covariates are suppressed in Table 3, all models control for the array of study covariates as in Table 2 and the lagged offending measures as stipulated in Figure 1, and Online Appendix A includes the results from the full models.

Panel A in Table 3 shows the contemporaneous effect of wave 1 exposure to violence on the wave 1 offending outcomes (i.e., $ETV_1 \rightarrow OFF_1$). The results in panel A are identical to those presented in Table 2 but are displayed for comparison purposes.

Panel B in Table 3 represents the acute effects by regressing the wave 2 offending outcomes on wave 1 exposure to violence (after 1 year), controlling for the lagged offending measures and the baseline study covariates (see Figure 1). The results indicate that wave 1 exposure to violence had significant acute effects on wave 2 property crime ($OR = 1.43, p < .001$), violent offending ($OR = 2.25, p < .001$), and substance use ($OR = 1.53, p < .001$). Also note that the upper bound of the 95 percent confidence intervals for the acute effects of exposure to violence on property crime, violent offending, and substance use (in panel B) were lower and did not

Table 3. The Contemporaneous, Acute, Enduring, and Long-term Effects of Exposure to Violence on Wave 1, Wave 2, Wave 3, and Wave 4 Property Crime, Violent Offending, and Substance Use, Controlling for Lagged Dependent Variables and the Baseline Study Covariates ($N = 7,706$).

Relationship	Property Crime		Violent Offending		Substance Use	
	OR	95 Percent CI	OR	95 Percent CI	OR	95 Percent CI
Panel A: W_1 offending as outcome; contemporaneous effects						
$ETV_1 \rightarrow OFF_1$	2.32***	[1.95, 2.76]	4.64***	[3.85, 5.58]	2.93***	[2.42, 3.54]
Panel B: W_2 offending as outcome; acute effects (1 year)						
$ETV_1 \rightarrow OFF_2$ (1 year)	1.43*** ^a	[1.19, 1.72]	2.25*** ^a	[1.88, 2.69]	1.53*** ^a	[1.25, 1.88]
Panel C: W_3 offending as outcome; enduring effects (5–6 years)						
$ETV_2 \rightarrow OFF_3$ (5 years)	0.96 ^{a,b}	[0.72, 1.27]	1.24 ^{a,b}	[0.98, 1.55]	0.91 ^{a,b}	[0.74, 1.11]
$ETV_1 \rightarrow OFF_3$ (6 years)	0.84 ^{a,b}	[0.68, 1.03]	1.34*** ^{a,b}	[1.06, 1.71]	1.07 ^{a,b}	[0.88, 1.31]
Panel D: W_4 offending as outcome; enduring effects (7 years) and long-term effects (12–13 years)						
$ETV_3 \rightarrow OFF_4$ (7 years)	1.20 ^a	[0.85, 1.68]	1.91*** ^a	[1.39, 2.61]	1.06 ^{a,b}	[0.90, 1.25]
$ETV_2 \rightarrow OFF_4$ (12 years)	1.26 ^{a,c}	[0.92, 1.71]	1.45*** ^{a,b}	[1.06, 1.99]	1.28*** ^{a,d}	[1.01, 1.61]
$ETV_1 \rightarrow OFF_4$ (13 years)	1.13 ^a	[0.83, 1.52]	1.35*** ^{a,b}	[1.01, 1.79]	1.06 ^{a,b}	[0.90, 1.25]

Note: Subscript numbers (1–4) refer to the wave in which the measure of exposure to violence or offending is drawn from.

All models control for the baseline study covariates as displayed in Table 2 and the lagged dependent variables as stipulated in Figure 1. OR = odds ratio; CI = confidence interval; ETV = exposure to violence; OFF = offending outcomes.

^aStatistically significant difference ($p < .05$) from the concomitant contemporaneous effect ($ETV_1 \rightarrow OFF_1$) in panel A. ^bStatistically significant difference ($p < .05$) from the concomitant acute effect ($ETV_1 \rightarrow OFF_2$) in panel B. ^cStatistically significant difference ($p < .05$) from the concomitant enduring effect ($ETV_1 \rightarrow OFF_3$) in panel C. ^dStatistically significant difference ($p < .05$) from the concomitant enduring effect ($ETV_2 \rightarrow OFF_3$) in panel C.

* $p < .05$. ** $p < .01$. *** $p < .001$.

overlap with the lower bound of the 95 percent confidence intervals for the contemporaneous effects of exposure to violence on property crime, violent offending, and substance use (in panel A); this indicates that there were significant differences in the magnitudes of these effects, such that the observed contemporaneous effects of exposure to violence were significantly greater than the acute effects. The results from adjusted Wald tests confirmed that these differences were in fact significant, as shown via the superscript “a” in the table.

Panel C shows the enduring effects of waves 1 and 2 exposure to violence on the wave 3 offending outcomes (five and six years later, respectively). Results indicate that wave 2 exposure to violence had a significant enduring effect on wave 3 violent offending ($OR = 1.24, p < .05$) after five years, and wave 1 exposure to violence had a significant enduring effect on wave 3 violent offending ($OR = 1.34, p < .01$) after six years. The upper bound of the 95 percent confidence intervals for both of the enduring effects of exposure to violence on violent offending (in panel C) were lower and did not overlap with the lower bound of the 95 percent confidence intervals for the contemporaneous effect (in panel A) or the acute effect (in panel B), indicating that there were significant differences in the magnitudes of these effects. Again, the results from adjusted Wald tests confirmed that these differences were in fact significant, as shown via the superscript “b” in the table. However, we did not observe enduring effects of wave 1 or wave 2 exposure to violence on wave 3 property crime or substance use.

Panel D shows the enduring effects of wave 3 exposure to violence, and the long-term effects of waves 1 and 2 exposure to violence on the wave 4 offending outcomes. The results indicate that wave 3 exposure to violence had a significant enduring effect on wave 4 violent offending, measured seven years later ($OR = 1.91, p < .001$). Additionally, waves 1 and 2 exposure to violence had significant long-term effects on wave 4 violent offending after 13 years ($OR = 1.35, p < .05$) and 12 years ($OR = 1.45, p < .05$), respectively. Between property crime and substance use, one long-term effect was detected: the effect of wave 2 exposure to violence on wave 4 substance use ($OR = 1.28, p < .05$) after 12 years. Adjusted Wald tests indicated that the magnitudes of the long-term effects of exposure to violence on violent offending (in panel D) were significantly lower than the magnitudes of the contemporaneous and acute effects of exposure to violence on violent offending (in panels A and B, respectively).

In short, four key patterns of findings emerged from Table 3. First, we observed significant effects for all contemporaneous and acute effects of exposure to violence on property crime, violent offending, and substance

use. Second, we observed significant enduring and long-term effects of exposure to violence on violent offending, suggesting that the effects of exposure to violence on violent offending persist over time. Third, the significant acute, enduring, and long-term effects of exposure to violence were observed while controlling for more recent exposure to violence, lagged measures of the offending outcomes, and the baseline study covariates. Fourth, the effects of exposure to violence displayed a decreasing pattern in magnitude and significance over time, as evidenced by nonoverlapping confidence intervals and adjusted Wald comparison tests. This pattern of findings is evident in Figure 2.

Supplemental Analysis

Smoking, drinking, marijuana use, and more illicit drug use vary in several respects: normative use across adolescence and young adulthood, legality across sample respondents (e.g., cigarette use prior to and after age 18), and perceived and psychopharmacological severity. Additionally, the time frame during which the substances were measured varied (e.g., the previous year for getting drunk and the previous month for smoking marijuana), and the aggregate measure of substance use used in the analysis above was weighted toward the less serious but more frequently used substances (getting drunk and smoking cigarettes), as is generally the case with summative scales. To examine the robustness of the findings to the measurement strategy for substance use, we conducted supplemental analysis in which we disaggregated the substance use measure into smoking cigarettes, getting drunk, smoking marijuana, and using illicit drugs (cocaine, methamphetamines, heroin, LSD, PCP, ecstasy, mushrooms, or inhalants), a common distinction made in prior research. The results are shown in Online Appendix B. With minimal variation, the pattern of results was generally consistent with those presented for the overall substance use variable: there were significant contemporaneous and acute effects of exposure to violence on each of the substance use outcomes, but no enduring or long-term effects were observed.

We also acknowledge that poly-victims have the highest risk of negative psychological and behavioral outcomes (Finkelhor et al. 2005; Ford et al. 2010; Hickman et al. 2013; Turner et al. 2017; Wright, Fagan, and Pinchevsky 2013). Consistent with prior literature, we consider poly-victimization “the experience of multiple victimizations of *different* kinds . . . not just multiple episodes of the same kind of victimization” (Turner et al. 2017:756). Exposure to violence is not measured as an

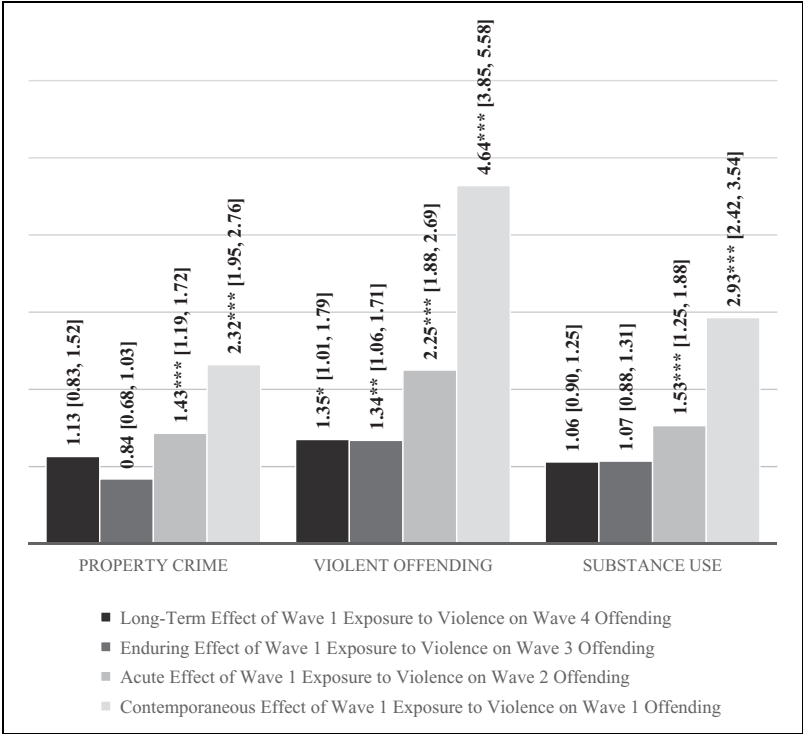


Figure 2. The contemporaneous, acute, enduring, and long-term effects of wave 1 exposure to violence on the offending outcomes measured at wave 1, wave 2, wave 3, and wave 4, respectively ($N = 7,706$). Bars are presented with odds ratios and 95 percent confidence intervals in brackets. $*p < .05$. $**p < .01$. $***p < .001$.

incident count in all waves of the Add Health data; therefore, we cannot measure prevalence over time. But, we can disaggregate exposure to violence into different types (witnessed violence, threatened violence, and experienced violence) and compare the effects of exposure to one (and only one) type of violence to the effects of exposure to multiple types of violence. We are thus able to provide a preliminary test of the effects of poly-victimization on the offending outcomes.

Online Appendix C examines the contemporaneous, acute, enduring, and long-term effects of exposure to one type of violence and exposure to two or more types of violence on the offending outcomes across all four study waves. The results indicate that the effects of exposure to more than one

type of violence were generally stronger than the effects of exposure to one type of violence; and again, the magnitude and strength of the effects of exposure to violence on the offending outcomes generally decreased over time. These results are consistent with those presented above and support the notion that poly-victimization is particularly detrimental for behavioral maladies across the life course.

Discussion

Examinations of the long-term consequences of exposure to violence on offending outcomes are sparse. Much of the research has measured exposure to violence and offending via retrospective, cross-sectional study designs; and prospective, longitudinal studies have generally been restricted to two consecutive time points encompassing a single developmental time period. The few existing long-term prospective assessments have not adequately accounted for recent experiences with violence when assessing the long-term effects of exposure to violence. Addressing these gaps in the literature, our study examined the contemporaneous, acute, enduring, and long-term effects of exposure to violence on property crime, violent offending, and substance use using four waves of Add Health data spanning 13 years. Importantly, our analysis simultaneously took into account both proximate and more distal effects of exposure to violence on offending. This strategy fits both the general strain theory framework and the longitudinal nature of our research question by examining exposure to violence in a dynamic fashion (Brame et al. 1999), accounting for measures of exposure to violence at multiple time points (Collins 2006; VanderWeele et al. 2016), controlling for lagged outcome measures from prior waves (VanderWeele et al. 2016), and accounting for potential initial conditions that could affect the relationships of interest (Brame et al. 1999).

The results yielded two key findings. First, all of the observed contemporaneous and acute effects of exposure to violence on the three offending outcomes were positive and significant. Additionally, the effect of exposure to violence on violent offending remained positive and significant after 5 to 7 years (enduring effects) and after 12 to 13 years (long-term effects). Thus, consistent with Hypothesis 1, the results indicated that the effects of exposure to violence were persistent for violent offending: the effects of more distal experiences with violence endured, even when controlling for more recent experiences with violence. Yet, contrary to Hypothesis 1, results did not demonstrate persistent effects of exposure to violence on property crime or substance use. Second, consistent with

Hypothesis 2, the effects of exposure to violence on the offending outcomes were attenuated over time, as evidenced by decreasing odds ratios when predicting violent offending, and by diminishing significance when predicting property crime and substance use. In particular, contemporaneous effects were stronger than acute effects for all offending outcomes, as evidenced by nonoverlapping 95 percent confidence intervals and adjusted Wald comparison tests; with respect to violent offending, enduring, and long-term effects were weaker than acute effects; and pertaining to property crime and substance use, we did not observe significant enduring or long-term effects of exposure to violence. It is also important to mention that we generally failed to observe significant differences between the enduring and long-term effects of exposure to violence.

We note several limitations of our study that may temper the study findings. First, our measure of exposure to violence captured experiences with violence during the 12 months preceding the wave 1 interview rather than lifetime exposure to violence. Although Add Health participants were not asked about lifetime exposure to violence, we acknowledge that some respondents may have been exposed to violence at an earlier time in their life course. It is therefore likely that our measure underestimated respondents' experiences with violence. As a result, our models likely provided conservative estimates of the effects of exposure to violence rather than overstating the effects. Future research using data that captures lifetime exposure to violence, as well as exposure to violence across different time points, would be an important addition to this area of research and better capture the potential role of initial conditions (Brame et al. 1999). Second, our analyses focused on offending outcomes, despite prior research documenting a wide range of adverse outcomes associated with exposure to violence. We urge future research to examine the enduring and long-term impact of exposure to violence on negative emotionality, mental health issues, negative biological responses, and suicidality. Third, prior research has documented the deleterious effects of repeat- and poly-victimization (Finkelhor, Ormrod, and Turner 2007). Our supplemental analyses indicated that exposure to two or more types of exposure to violence (witnessed, threatened, and experienced violence) had enduring effects on violent offending that were at least as strong, and in many cases stronger than the effects of exposure to one type of violence. Nonetheless, we leave it to future research to more comprehensively address the long-term effects of poly-victimization, which is more aptly defined as exposure to multiple incidents of multiple types of violence (Turner et al. 2017:756). Fourth, we note that four of the five items in our measure of exposure to violence

refer to weapon-based violence. Because this limits the content validity of our measure, we encourage future research to examine whether our findings generalize to more comprehensive measures of exposure to violence. Finally, we recognize that the wave 1 in-home survey conducted by Add Health is roughly 22 years old, while the wave 4 in-home survey is 9 years old. Moreover, only adolescents enrolled in school were eligible to participate in the surveys. While long-term prospective studies require aged data to be collected over time, the age of the data combined with the school-based sample may limit the generalizability of our results.

Despite the limitations, our findings hold several key insights for theory, research, and practice. Previous studies have largely discounted the role of time in their assessments of the victim-offender overlap (cf., Fagan 2003; Fergusson and Horwood 1998; Maxfield and Widom 1996; Menard 2002). Research has tended to focus on establishing the causal order between exposure to violence and offending (Jennings et al. 2010) rather than on understanding how the victim-offender overlap operates across different developmental time periods. But, general strain theory suggests: (1) that exposure to violence can have persistent effects on future behavior, (2) that stress-responses (e.g., negative emotionality) and maladaptive coping responses (e.g., offending) to strain (e.g., exposure to violence) are most likely to occur shortly after the catalyst for strain, and (3) that strain which is long in duration or is experienced at multiple time points may have a stronger impact on the use of maladaptive coping strategies (Agnew 1992, 2002). Consistent with general strain theory, we detected acute, enduring, and long-term effects of exposure to violence on violent offending that attenuated over time.

This connects directly to a note of correction from Maxfield and Widom (1996:393), who modified their earlier conclusion (from Widom 1989) “that the majority of abused and neglected children in the sample did not become offenders” after a long-term follow-up found that nearly half of those exposed to violence had an arrest for a nontraffic offense by their early thirties. Similarly, we found that time frame alters the strength and existence of the victim-offender overlap, highlighting the importance of addressing both time lapse and developmental period in the study of victimization and indirect exposure to violence.

Relatedly, the results suggest that the strongest effects of exposure to violence are immediate. Accordingly, we observed contemporaneous effects that were significantly stronger than acute, enduring, *and* long-term effects of exposure to violence. Yet, the results also suggest that the effects of exposure to violence on violent offending both persist (in terms of

being impactful) and remain stable over a relatively long period of time spanning different developmental time periods. Remarkably, exposure to violence impacted violent offending behaviors 1, 5 to 7, and 12 to 13 years later. These findings support general strain theory by: (1) highlighting the strength of recent exposure to violence (i.e., contemporaneous effects), and (2) reiterating that strain can have lasting consequences across the life course (i.e., acute, enduring, and long-term effects), net of recent strain-inducing events. As Agnew (1992) contends, responses to negative emotional states following strain often occur promptly; yet, strain (and anticipated strain) can be impactful over time, particularly when it is pervasive, occurs repeatedly, or increases in intensity.

We also note that the overlap between victimization and offending can be situated within a number of theoretical frameworks beyond general strain theory, including social control theory (Hirschi 1969) and social learning theory (Akers and Jensen 2003). While general strain theory focuses on negative relationships that produce strain through means such as noxious stimuli, social control theory focuses on the absence of beneficial relationships with conventional others. The former suggests a dynamic relationship under which individuals may respond to strain-inducing negative emotional states via maladaptive coping strategies, whereas the latter is suggestive of a more static relationship between weak or absent prosocial bonds and offending. Our findings suggest that parental bonds, school bonds, and neighborhood bonds are influential correlates of offending behaviors, while demonstrating that exposure to violence remains a significant predictor of violent offending over time, controlling for these influential bonds. We thus consider both general strain theory and social control theory as relevant frameworks from which to understand the causal mechanisms responsible for perpetuation of the victim-offender overlap. We also note that while we did not explicitly test key assertions of social learning theory—with peer relationships, for example—our findings align with prior research indicating that exposure to violence is part of a socialization process that encourages subsequent offending behavior (Agnew 2001; Anderson 1999). That is, exposure to violence may model and reinforce violent behavior as a viable coping and problem-solving strategy. Witnessing and experiencing violence may also reinforce the perception that violence is tolerated, expected, or even required as a conflict resolution tool (Baron 2004; Jennings et al. 2011). This is further evidenced by the diminished effect of exposure to violence on property crime and substance use over time, but the unique persistence of the relationship between exposure to violence and violent offending. Future research should examine exposure

to drug use and nonviolent crime within this modeling framework to further disentangle the role that social learning plays between exposure and offending.

Furthermore, we stress the importance of our finding of heterogeneity across the offending outcomes. Specifically, exposure to violence was associated with an increased odds of engaging in all three offending outcomes contemporaneously and after one year, but enduring and long-term effects were only observed for violence. These findings align with previous research on the cycle of violence (Widom 1989), which demonstrates that exposure to violent victimization (regardless of form) is more likely to impact subsequent violent offending than nonviolent offending. The persistent relationship that we observed between exposure to violence and substance use is consistent with some prior research (Fergusson and Horwood 1998) yet counters others (Menard 2002).

Our results also highlight the importance of controlling for new instances of exposure to violence across multiple time points when examining the long-term relationship between exposure to violence and offending. This poses challenges, however, including the lack of multiwave longitudinal studies that collect information on the same social processes across time. Add Health is particularly useful in this regard, allowing for the measurement of exposure to violence and offending across numerous time points and developmental periods of the life course. Although a wealth of research using the Add Health data has examined the victim-offender overlap, much of this research has focused on examining the effects of different types of exposure to violence, including childhood abuse, witnessing violence, violent victimization, and sexual victimization (see, e.g., Farrell 2017; Matjasko et al. 2010; Savage et al. 2014; Spriggs, Halpern, and Martin 2009). Research using the Add Health data to examine the relationship between exposure to violence and offending over numerous time points, while accounting for exposure to violence at distal as well as proximal time points, is sparse. Our study contributes to the burgeoning literature on exposure to violence using the Add Health data by partitioning the contemporaneous, acute, enduring, and long-term effects of exposure to violence on offending. Moreover, our study accounts for prior offending behavior using lagged outcome measures. This strategy allowed for a robust assessment of the effects of distal experiences with violence, while purging these effects of potential confounding with more recent exposure to violence and prior offending behavior (Malinosky-Rummell and Hansen 1993; VanderWeele et al. 2016). Particularly, given the frequency of repeat exposure to violence (Turner et al. 2010), it is critical to account for

proximate experiences with violence in order to avoid overestimating the effects of earlier exposure to violence (Collins 2006) and to more accurately capture the dynamic nature of exposure to violence over time (Brame et al. 1999). In short, in order to understand the long-term impact of exposure to violence, researchers must use available data with repeated measures of exposure to violence and an appropriate analytical strategy that utilizes the information in these measures (VanderWeele et al. 2016), as we do here.

Practically, our results suggest that repeated interventions are necessary following exposure to violence. Continually addressing exposure to violence is critical given: (1) that nearly 17 percent of our sample participants reported exposure to violence at more than one study wave, and (2) that we observed persistent effects of exposure to violence on violent offending behaviors over the course of 13 years. When triaging recent exposure to violence incidents, it is also important that school counselors and medical providers: (1) screen for and address earlier experiences with violence, and (2) provide ways to avoid and cope with future experiences with violence. Several screening and assessment tools are available for youths and adults (Finkelhor et al. 2005; Hamby and Finkelhor 2001).

In addition, interrupting the link between exposure to violence and offending requires intervention strategies that address traumatic experiences while fostering protective factors such as positive coping skills and temperament management. Trauma-focused cognitive behavioral therapy (TF-CBT), for example, teaches relaxation skills, affective modulation skills, positive parenting, and positive coping techniques to both adolescents affected by violence and their parents (Cohen et al. 2004; Hamby and Finkelhor 2001). While research has demonstrated that TF-CBT can effectively reduce exposure to violence and its debilitating sequelae in the short-term, its treatment period is typically limited to 12 to 16 sessions. Our results suggest that sequential interventions utilizing TF-CBT that persist with at least some frequency over time may be effective at limiting the long-term effects of exposure to violence on violent offending, although additional research is required to confirm this speculation.

Finally, it is critical that interventions take into account research aimed at understanding the etiology of exposure to violence and target the risk factors for exposure to violence. For example, community programming that addresses gang violence and in-school interventions that target bullying may help to decrease exposure to violence in the first place (Fagan 2003).

Conclusion

This study addressed an important gap in the literature by examining the contemporaneous, acute (after 1 year), enduring (after 5–7 years), and long-term (after 12–13 years) effects of exposure to violence on violent offending, property crime, and substance use. Using data from a nationally representative sample of adolescents and young adults from Add Health, models indicated that exposure to violence had enduring and long-term effects on violent offending, net of more recent experiences with violence and prior violent offending. This finding reaffirms the key insight that determining whether violent behaviors are long-term consequences of distal experiences with violence *or* short-term responses to ongoing or recent exposure to violence necessitates statistical models that control for recent exposure to violence. The only way to partition exposure to violence into short- and long-term effects is to model exposure to violence at distal as well as proximal time points across multiple study waves.

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Supplemental Material

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