Exposure to Violence: An In-Depth Analysis from Adolescence to Early-Adulthood

by

Douglas R. Roehler

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Health Behavior and Health Education)
in the University of Michigan
2017

Doctoral Committee:

Professor Marc A. Zimmerman, Chair
Associate Professor José A. Bauermeister, University of Pennsylvania
Research Assistant Professor Justin Heinze
Assistant Professor Sarah A. Stoddard

Douglas R. Roehler

droehler@umich.edu

ORCID iD: 0000-0003-3646-7174

DEDICATION

This dissertation is dedicated to my parents.

ACKNOWLEDGMENTS

Despite this body of work having just one author, this dissertation was not a solo endeavor. It has taken a lifetime of love, support, guidance, and laughter to put together this final product.

In the fall of 2006, Professor Marc Zimmerman interviewed me for a three-month summer internship in Durban, South Africa, as part of the Minority Health International Research Training (MHIRT) Program. At the time, Marc was the chair of the Department of Health Behavior and Health Education at the University of Michigan School of Public Health. I was a 19-year-old kid, who had never heard of the School of Public Health, getting interviewed by this world expert in empowerment theory, adolescent health, and resiliency. When I walked out of the interview, I knew it was over. We had spent the majority of interview discussing our fascination of Jack Bauer from the hit show, *24*. Well, whatever it was, Marc took a chance and saw something in me that has continued to drive me. Marc has been there to coach me, push me, challenge me, and most importantly, to support me throughout my academic career. I look forward to many more decades of his tutelage.

I would never have completed this long journey of training if not for my mom, dad, and sister. Mom, Dad, & Kim: thank you for asking questions, reminding me that the end is in sight, and by providing me with respite through a home-cooked meal and a warm bed when I needed a break. Thank you for being understanding that my pathway is not a traditional one. And thank you for being supportive, even though my career forces me to live further and further from Oak Park. You three will always be my home.

There are too many mentors, role models, and colleagues to list here. I am indebted to Professor Jean Shope, for first introducing me to the field of injury prevention, and then connecting me with the wonderful group at the Centers for Disease Control and Prevention. I feel the CDC is where I started to become public health professional. They offered me tremendous responsibility and experiences that forever changed the person who I am today. At the CDC, I would like to particularly thank Drs. Mick Ballesteros, Ann Dellinger, Grant Baldwin, and David Sleet. These scientists taught me the importance of translating research into practice. My home at the CDC was one of the most nurturing research environments a kid who just received his MPH could ask for.

To the other members of my dissertation committee: Professors Bauermeister, Heinze, & Stoddard. Thank you for being available for brainstorming in your office, venting my frustrations on Google Hangout, and for taking the time to talk with me (when necessary) about anything so long as it had nothing to do with my dissertation. This group became more than just individuals tasked with critiquing my dissertation. I felt they became a group that was legitimately invested in my success as both a public health researcher, and as a well-rounded man.

There are many others who had a less direct, but still significant role in my academic career and dissertation. First is Dr. Kirsten Herold, who helped develop my skills from an academic writing and critical-thinking perspective. Also, gratitude is owed to Kirsten for keeping me accountable with deadlines and for being there to lightly commiserate with on worldly affairs. Next are all of my colleagues at SPH. The community in HBHE and around SPH allows for healthy debate, sounding boards, and academic development. Thanks to not only my cohort, but the other cohorts in HBHE, who have pushed me to elevate my scholarship. Importantly, appreciation is owed to my network of *pals*. Too numerous to name individually, but thank you

for always making time when a beer, round of disc golf, or a night of euchre was in order. The support you all have offered when personal morale was low allowed me to cross the finish line.

Lastly, Erin. Whether it is one of my marathon writing nights, where you keep me fueled with caffeine and sustenance, or the pep talks you continuously provide when you suspect any inkling of self-doubt. You have taught me the importance of being passionate about my work. Thank you for joining me in this journey.

TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

As the leading cause of death for young African American males, violence is a severe public health problem. This dissertation focuses on exposure to violence (ETV). ETV is defined here as family conflict, witnessing violence in the community, and victimization.

I found that being exposed to violence during emerging adulthood (ages 20-23 years) is associated with increasing rates of substance use during early-adulthood (ages 29-32 years). Moreover, I found that just two instances of ETV distinguished respondents with an increasing rate of substance use and those with no change. Using a latent profile analysis approach, I found that individuals could be grouped into low, medium, and high ETV profiles. These three ETV profiles from late-adolescence predicted violence perpetration. Specifically, individuals in the high ETV profile were more likely to have higher violence perpetration in early-adulthood compared to those with a low ETV latent profile. No differences were found among these three ETV latent profiles and depressive symptoms or substance use.

The findings from this dissertation help to better understand the consequences of violence victimization and inform efforts to reduce them. Given the long-term consequences of being exposed to violence, spanning several developmental stages, we learn that ETV can be a serious and traumatic experience, deserving serious attention from health practitioners. By investigating ETV using a latent profiles, we learn that it is possible to have multiple concurrent exposures to violence. This analytical approach is novel for studying ETV, and is significant because it allows researchers to study ETV in a particularly sensitive and nuanced manner. This is especially important given how little exposure to violence is needed to increase one's risk for long-term consequences. This more nuanced approach to investigation may also decrease the odds for

subsequent repercussions to exposure to violence, and interventions can be tailored for different patterns and types of exposures. These findings are important because we start to learn how multiple forms of violence may cluster together to form risk. They can help provide a framework for studying how different profiles of exposure may change throughout their life. This approach also allows us to study if different patterns of distinctive types of violence exposure early in life contribute to health various consequences later in life.

Chapter 1: Introduction

Introduction

In 2001, the U.S. Office of the Surgeon General issued a report declaring youth violence the "greatest threat to the lives of children and adolescents" in the US (Centers for Disease Control and Prevention [CDC], 2015; Sleet et al., 2012; USDHHS, 2001, paragraph 2). The CDC typically includes youth between 10 and 24 years of age when referring youth violence (CDC, 2016). Today, violence continues as the leading cause of death and the sixth most common cause of nonfatal injury for young Black men in the United States (14-25 years). In 2013, more young Black American males died from violent-related injuries than unintentional injuries (e.g., car crashes, poisonings), heart disease, HIV, and cancer combined (2,761 and 1,677, respectively) (CDC, 2015). In 2013, violence contributed to over a quarter of a million non-fatal emergency department visits for this population (CDC, 2015). Of those who commit acts of youth violence, Blacks represent 46% of youth waived to criminal court and 58% of youth admitted to state prisons (Sickmund & Puzzanchera, 2014). Currently, and in part due to these disproportionate rates in violence, one out of every three Black males in the US can expect to serve time in prison during the course of his lifetime, compared to one in seventeen White males (Mauer, 2011). Youth violence increases costs to the health care system, criminal justice services, and social services, while simultaneously reducing property values, productivity, and the overall fabric of society (Krug, Mercy, Dahlberg, & Zwi, 2002).

In addition to the fatalities and injuries caused by violence, violence has substantial psychological and behavioral effects. The long-term effects of exposure to violence can be substantial. In this dissertation, exposure to violence is defined as witnessing violence in one's

community, family conflict in one's household involving aggressive behaviors, and being the victim of a violent act. Some researchers may refer to these experiences as poly-victimization.

The more exposure to violence a young person experiences, the more likely they are to become normalized to the use of violence for conflict resolution and subsequent pro-violent beliefs can continue into adulthood (Arnett, 2000a; Garbarino, Bradshaw, & Vorrasi, 2002). Someone who simply witnesses an act of violence in their community may be at an increased risk for committing violence themselves (Krug et al., 2002). Conversely, researchers suggest violence perpetration may be a product of being exposed to violence early in life (Dahlberg, 1998; Finkelhor, Ormrod, Turner, & Hamby, 2005). Nationally, rates of exposure to violence among youth 17 years and younger is as high as 61%, and these rates are even higher among inner-city Black youth (Finkelhor, Turner, Ormrod, Hamby, & Kracke, 2009; Schubiner, Scott, & Tzelepis, 1993). Thus, public health practitioners might strengthen their intervention efforts to protect youth most at risk for violence perpetration, and study the sequelae to better understand how exposure to violence may contribute youth violence perpetration.

Researchers often state that exposure to violence is a risk factor for later violent perpetration and victimization, but this assumption has not been adequately tested. The 2001 Surgeon General's Report states: "Studies have shown that adolescents exposed to violence are more likely to engage in violent acts," and then goes on to cite several studies, none of which I found to actually test this relationship (pg. 1902). Cited in the report, Fagan & Wilkinson (1998) discuss how exposure to violence should, theoretically, lead to violence given a script framework, but they did not actually conduct a study (Fagan & Wilkinson, 1998). Another cited study linked exposure to violence to symptoms of psychological trauma, but not to violent behaviors (Singer, Anglin, Song, & Lunghofer, 1995). Other studies that are frequently cited

when linking exposure to violence with subsequent violent behaviors have yielded inconsistent results (Finkelhor et al., 2005). Some frequently cited researchers have not found a significant relationship (Feigelman, Howard, Li, & Cross, 2000). With these inconsistent findings, it is difficult to declare an association between exposure to violence and later consequences. Before researchers can conclude that exposure to violence is a risk factor for later violence perpetration, we need a better understanding of exposure to violence.

Moreover, many of these studies are limited by poor measurement and poor study design (Hastings & Kelley, 1997). For example, measures of exposure to violence tend to be narrow in scope and focus on only one specific domain (e.g., sexual, community, family) instead of several different domains of exposure (Aisenberg, Gavin, Mehrotra, & Bowman, 2011; Terr, 2003). Most exposure to violence measures simply sum binary items to produce an overall exposure to violence score (Wright, 1998). This analytical approach is problematic as it loses information on the differential effect of experiencing acute versus chronic exposures, and cannot capture the effect of salient versus less prominent events. Most measures also do not assess concurrent forms of exposure to violence, thereby limiting effective interventions for how someone who may be exposed to multiple forms of violence. While some measures include items asking about isolated severe events (e.g., shootings, seeing someone killed, or being attacked with a weapon), most measures miss less acute pervasive indicators of violence (e.g., peer violence in school, family conflict) (Wright, 1998). Moreover, many measures do not allow researchers to study the effects of exposure to violence across simultaneous different domains of exposure (e.g. home, school, and community). Thus, to better understand the relationship between exposure to violence with other health outcomes, we need a more comprehensive measure of exposure to violence and of how individuals can be exposed to concurrent forms of violence. Such an approach would

establish unique exposure to violence profiles allowing researchers to account for multiple forms of concurrent exposure to violence. Researchers could investigate how different exposure to violence profiles could have unique long-term symptomology, helping practitioners tailor strategies for developing interventions.

In this dissertation, violence perpetration will not be included in an exposure to violence measure because the differences in effects between being a victim and a perpetrator of violence may be too dissimilar to treat them equally. For example, violence perpetration is an active behavior, whereas witnessing someone be victimized could be considered passive. Additionally, one research question explored in this dissertation is if there is a long-term association between violence exposure and violence perpetration.

My conceptual foundation for this dissertation integrates several public health theories and models: Stress-coping model, self-medication hypothesis, and socioecological model. While this dissertation does not attempt to prove any of these models directly, the research questions in this dissertation are each derived from the theories and models as discussed below. Moreover, I get into detail about some of the believed causes of violence, across several levels of the socio-ecological model, to provide a comprehensive picture, even though I may not directly measure or study these other levels of the socio-ecological model. I do this to provide the reader with a comprehensive framework for studying exposure to violence.

Stress-coping model

Experiencing stressful events (either chronic or acute), and the psychological or emotional stress that follows, is strongly associated with substance use (Shiffman, 1993). Stressful events that would invoke such a coping response include several experiences such as the death of a loved one, a natural disaster, or being the victim of violence. In the stress-coping

model, the use of alcohol and other drugs (e.g., tobacco, marijuana) is a coping response to stress, and substances are used to either heighten positive affect or lower negative affect (Wills & Shiffman, 1985). Some individuals who experience stress have a positive coping response, such as exercising, seeking counseling, praying, or meditating, while others may have a maladaptive coping response, such as isolation, negative self-talk, aggression, or substance use consumption (Thoits, 2010). When researchers conduct surveys of adults in the general population, they find that those under higher levels of stress have greater substance use initiation, have higher rates of substance use, and use more substance (e.g., smoke more cigarettes, smoke more marijuana, drink more alcohol) (Finkelstein, Kubzansky, & Goodman, 2006; Roberts, Fuemmeler, McClernon, & Beckham, 2008; Sullivan, Kung, & Farrell, 2004; Wills & Cleary, 1996). Yet, to date researchers have not studied adequately the relationship between exposures to violence and developing later coping responses (i.e., substance use). When investigators have attempted such a study, they employ a cross-sectional analysis and a narrow exposure to violence measure (Vermeiren, Schwab-Stone, Deboutte, Leckman, & Ruchkin, 2003).

Exposure to violence can be a traumatic experience and is the most frequently reported stressor in the lives of young African Americans living in communities characterized by high levels of crime (Berton & Stabb, 1996; Sanchez, Lambert, & Cooley-Strickland, 2013). Youth exposed to violence are at an increased risk for depressive and anxiety symptoms, academic problems, homelessness, aggression and conduct problems, suicidal thoughts, physical injuries, and engagement with the criminal justice system (Krug et al., 2002; Menard, 2002; Vermeiren, Schwab-Stone, Deboutte, Leckman, & Ruchkin, 2003; Wordes & Nunez, 2002). According to the stress-coping model, youth exposed to violence are expected to have higher rates of

maladaptive coping responses later in life, yet researchers still need to look at this hypothesis more critically.

Youth who grow up in poverty, in unsafe neighborhoods, or in environments with many stressors are more likely to have less access to healthy coping resources and more difficult coping responses to stress (Baum, Garofalo, & Yali, 1999; Lantz et al., 1998). These communities tend to be characterized by limited access to healthy coping resources because they may have inadequate social services, insufficient safe spaces for youth, increased parental and community stress, and decreased social support, compared to other communities (Taylor & Stanton, 2007). Furthermore, these communities are likely to have elevated rates of violence compared to the general population. One's social environment is a driver of stress and coping. Stress proliferates over time and contributes to additional stressors (Pearlin, Schieman, Fazio, & Meersman, 2005). For example, prior stressors contribute to how one may cope with the current stress; if an individual experiences multiple stressors over time, they are more likely to experience difficult adaptation (Failla & Jones, 1991; McCubbin & McCubbin, 1996). Consequently, residents in communities with high levels of stress, violence, and limited access to healthy resources are at high risk of maladaptive coping behaviors, such as substance use (Wills & Filer, 1996; Wills & Shiffman, 1985).

Self-medication hypothesis

The psychological pain that is a consequence of experience traumatic event(s) is evidenced by the high rates of associated posttraumatic stress disorder (PTSD). In one study, 29% of youth exposed to violence reported clinical levels of PTSD (Berton & Stabb, 1996). According to the self-medication hypothesis, heavy substance users engage is consumption as a defense mechanism to dull the pain and protect one's ego (Khantzian, 1997). The substance use

begins not as a means for seeking pleasure from the substance, rather as an attempt to mitigate the negative repercussions of a previous experience. For example, alcohol and other related substances are commonly used as a defense mechanism because such substances temporarily soften defenses and create an illusion of relief (Khantzian, 2007).

Although the self-medication hypothesis has yet to be adequately studied in a sample of youth exposed to violence, researchers have found evidence to support the self-medication hypothesis among those who have experience domestic violence, sexual abuse, and other forms of victimization (Kaysen et al., 2007; Miranda, Meyerson, Long, Marx, & Simpson, 2002; Sells, Rowe, Fisk, & Davidson, 2003). This dissertation will explore how different forms of exposure to violence is associated with self-medicating behaviors, and if these self-medicating behaviors have lasting effects.

Socio-ecological model

Certain subpopulations of the United States are at an increased risk of experiencing violence. In a nationally representative sample of youth (ages 12-17), Crouch and colleagues (2000) found that poverty is a risk factor for violence exposure. Even when income is controlled, African Americans are more likely to experience violence exposure (Crouch, Hanson, Saunders, Kilpatrick, & Resnick, 2000). To better understand why poor African Americans have higher rates of exposure to violence, Bronfenbrenner's social-ecological model (SEM) can help explain this relationship. The SEM describes levels of ecological systems that must be considered when trying to explain human behavior (Bronfenbrenner, 1986). A level refers to an environmental system in which an individual has contact. In this dissertation, I will be referring to four levels: macrosocial, community, interpersonal, and individual. The macrosocial level includes aspects of history, institutions, policies, and the media that affect different individuals in different ways. It

includes culture and ideologies, which may evolve from one generation to the next. The community level comprises wide networks in one's immediate environment (e.g., school, neighborhood, church). Each of these communities may have their own policies, practices, and culture that can be influenced from the broader macrosocial, and may influence subsequent levels. Next, the interpersonal level refers to interactions and influence from other individuals. For example, one's peer group, family, or neighbors may interact with an individual and thereby influence an individual's thoughts or actions. The community and macrosocial levels often affect the interpersonal level. Lastly, the individual level includes aspects of oneself such as knowledge, attitudes, and skills. Individual characteristics do not evolve in isolation. Rather, individual beliefs and behaviors are influenced by other ecological levels. Each level of the socially organized subsystem is dependent on the individual's specific context and provides many sources of influence (Bronfenbrenner & Morris, 2007). The SEM allows for multiple levels of influence on behavior, focuses on the interrelations between persons and their social and physical environments, and provides a framework to understand how social determinants of health behavior interact (Sallis, Owen, & Fisher, 2008).

This model improves on individual-based approaches that attribute disease to individual behaviors without an understanding of the context within which these behaviors occur (Frohlich & Potvin, 2008). Predictors of behavior can occur across levels, across points in time, and can be cross-lagged to occur both across domains and points in time (Bronfenbrenner & Morris, 2007). Put another way, an event that occurs at one point in time at one level can affect another level at a later point in time. This last point is particularly important because it suggests that being exposed to violence in adolescence may be associated with sequelae later in life.

I will test different aspects of this conceptual model in a sample of predominantly urban and poor African American youth and young adults given their disproportionately high risk of being exposed to violence compared to the rest of the population (Schubiner et al., 1993). This disparity can be partly explained according to SEM. Historical conditions (macrosocial level), such as housing discrimination practices and redlining starting in the 1930s, forced Blacks to be concentrated in urban areas with deteriorating social services (Gee & Ford, 2011; Hirsch, 2009; Staub, 1996). Due to deep social and cultural institutions, evidence of such practices can still be seen today (Gee & Ford, 2011). These communities have limited jobs, high incarceration rates, high rates of households below the poverty line, and neglected social services (e.g., schools and health services) (Aponte, Neckerman, & Wilson, 1985; Wilson, 2012). These macrosocial and community level factors contribute to high rates of female-headed households, which are associated with high rates of poverty and a family structure that decreases parental monitoring (DeNavas-Walt, Proctor, & Smith, 2014; Williams & Collins, 2001). Deviant peer groups and gang involvement are more prevalent in low-income urban communities due to the norms created through the code of the street, limited informal social control, peer influence, and historical conditions, all of which increase one's risk of exposure to violence (Anderson, 2000; Wilson, 2012).

The pathways and associations mentioned above are all related to exposure to violence. Importantly, they are also related to one's way of coping with stress and trauma. The macrosocial factors that are associated with concentrated poverty for African Americans in urban environments have resulted in high rates of daily stress (Williams, Yu, Jackson, & Anderson, 1997). The accumulation of daily stress takes a toll on an individual, both physically and mentally, as they are more likely to have elevated rates of precursors to chronic conditions, and

many of these precursors stem from substance use (Sapolsky, 2004). While researchers have identified a sense of control over one's life, high self-esteem, and social support as efficacious stress-buffers, low-income minorities generally have lower levels of these characteristics (Thoits, 1995; Turner & Marino, 1994; Turner & Roszell, 1994). Due to growing up in a community that has been neglected and discounted, in an environment that fosters poor future orientation, and in a society that disproportionately incarcerates similar others, all due to every level of SEM, poor future orientation, and urban African Americans are more likely to have a poor coping response when faced with trauma, such as exposure to violence (Arnett, 2000b; Mauer, 2011; Wilson, 2012).

Research aims

(1) To determine if exposure to violence at one point in life is associated with increasing rates of coping mechanisms later in life,

(2) To identify different exposure to violence profiles to better understand how multiple forms of exposure may be concurrent, and

(3) To look at the long-term consequences of the aforementioned exposure to violence profiles for depressive symptoms, violence perpetration, and depression.

Sample

The data for these studies were collected as part of the Flint Adolescent Study (FAS). Data collection began in 1994 when students entered 9th grade and continued for 12, nonconsecutive waves (included ages 31-33 in wave 12). In wave 1, this longitudinal study consisted of 850 ninth graders from the four main public health schools in Flint, Michigan. In the initial sample, participants self-reported their race/ethnicity and included a predominantly African-American sample: 679 African-Americans (80%), 145 Whites (17%), and 26 mixed

African-American and white (3%). Both sexes were of similar age and equal in quantity at the start of the study (Males: $M = 14.93$, $SD = 0.66$; Females: $M = 14.79$, $SD = 0.62$).

Since the 1970s, over 70,000 automotive workers have lost their jobs in Flint and the city has one of the highest unemployment rates in the country (Bureau of Labor Statistics, 2014). Among cities with a population greater than 50,000, Flint had the highest murder rate in the United States in 2012 (FBI, 2015). Rates of murder, rape, robbery, aggravated assaults, and other violent crimes surpass state and national levels (FBI, 2015). According to census tract data, the median household income in 2012 was $26,339, and nearly 40% of the population was living below the poverty level (U.S. Census, 2013).

FAS began as an analysis of youth at risk for school dropout; consequently, only students with a grade-point average of 3.0 or lower upon entering high school were eligible to participate. For the subsequent studies, poor academic achievement is a risk factor for many of our outcome variables, but, by the time students in the sample were in their senior year of high school, academic performance was more normally distributed (Zimmerman, Caldwell, & Bernat, 2002). Additionally, only students identified by the schools as not having emotional and/or development impairments were included in the study.

Trained research assistants collected non-threatening data through structured face-to-face interviews (e.g., education, social support, attitudes). For more sensitive questions (e.g., alcohol and drug use, sexual activity, violence participation) participants self-administered the questionnaire on a pencil and paper portion at the end of the interview in privacy. Retention rates for each wave can be found in Table 1.

Table 1.1 Retention rates for Flint Adolescent Study

Year	wave 1 1995	wave 2 1996	wave 3 1997	wave 4 1998	wave 5 2000	wave 6 2001	wave 7 2002	wave 8 2003	wave 9 2009	wave 10 2010	wave 11 2011	wave 12 2012
Sample (% retained)	850 (100)	812 (95.5)	783 (92.1)	770 (90.6)	572 (67.3)	639 (75.2)	576 (67.8)	579 (68.1)	341 (40.1)	401 (47.2)	414 (48.7)	384 (45.2)
Average age	14.8	15.8	16.8	17.9	20.1	21.0	22.1	23.1	29.3	30.3	31	32

This dissertation explores several stages of development, including: late-adolescence (ages 16-19 years), emerging adulthood (ages 20-23), and early-adulthood (ages 29-32).

The UM IRB and Flint School Board reviewed and approved all study procedures and materials.

Paper 1

Background: The objective of this study is to investigate if being exposed to violence early in life is a risk factor for changes in rates of substance use later in life. Roughly half of all youth (8^{th}-12^{th} graders) in the United States have used at least one illicit substance (e.g., tobacco, alcohol, marijuana) in their lifetime. Despite major public health efforts to decrease these trends, those living at or below the poverty line are more likely than the rest of the population to have a substance use disorder. According to the stress-coping model of substance use and the self-medication hypothesis, individuals are more likely to use substances when stressed. African Americans living in urban environments have elevated rates of exposure to violence, a known traumatic event. In some urban, predominately poor African American communities, 81% of youth have been exposed to violence.

Methods: Participants included 850 individuals from a predominately poor, urban community. Exposure to violence was measured four times in subsequent years during emerging adulthood (ages 20.1-23.1 years) and substance use was measured four times during early-adulthood (ages 29.3-32 years). Missing values were imputed with expectation-maximization imputation techniques. Several multilevel growth models were conducted to investigate the relationship between early exposure to violence and later rates of substance use behaviors.

Contributions: By investigating the relationship between early exposure to violence and later substance use behaviors, I explore how development and one's reaction to exposure to violence are associated with substance use later in life. These findings may inform intervention development to better protect against the sequelae of exposure to violence. For example, it may be beneficial for prevention programs that focus on those exposed to violence to specifically address cigarette, tobacco, and marijuana use.

Paper 2

Background: The objective of this study is to identify different profiles of various forms of violence exposure and examine how the different patterns of exposure may differ by demographic characteristics (e.g., gender, ethnicity) and violence perpetration. Exposure to violence is the most frequently reported stressor in the lives of African American youth. In some communities, rates of exposure to violence for young persons are as high as 81%. While many researchers state that exposure to violence is associated with many later detrimental health effects, the measures of exposure to violence used to study these relationships are often poor, and the study designs are weak. For example, most measures do not consider the fact that many individuals are exposed to multiple forms of violence concurrently. Studies that simply sum

multiple forms of exposure to violence fail to differentiate individuals who are experiencing unique exposure to violence profiles, and individuals may not be receiving appropriate intervention.

Methods: Participants included 770 youth (*M* = 17.9 years) from a disadvantaged community. Youth were asked several items to measure their levels of family conflict, amount of violence they have observed, and violent victimization. Multiple latent profile analyses were performed to find classes with the best fit. Additionally, groups were compared using ANOVAs and chi-squares to determine differences in demographics and violence perpetration.

Contributions: If distinct clusters are found showing multiple forms of exposure to violence profiles, researchers can begin studying exposure to violence and the subsequent outcomes in a more nuanced way. This could allow for next pathways to be uncovered between different exposure to violence profiles and sequelae. Such patterning of different forms of exposure to violence may allow health practitioners to better identify and address different forms of exposure to violence. By learning the possibility of different, co-occurring exposures to violence, health care providers will be less likely to miss identifying exposures to violence, which will increase the chance that the victim receives adequate treatment.

Paper 3

Background: The objective of this study is to determine if latent profiles of exposure to violence (i.e., low, medium, high exposure to violence) can be used to determine if exposure to violence during emerging adulthood are associated with violence perpetration, substance use, and depressive symptoms in early-adulthood. These outcomes of interest have never been examined across developmental stages using a latent profile analysis. This technique allows us to study if

difference domains of exposure to violence (i.e., family conflict, witnessing violence, victimization), occurring concurrently, have differential symptomology across developmental stages. I hypothesize that given the severity of the trauma one experiences when exposed to violence, those with a medium and high exposure to violence profile will have higher rates of substance use and depressive symptoms. Additionally, given the frequency of the use of violence to solve problems in this sample, I hypothesize that those with higher rates of exposure to violence will be more likely to be a violent perpetrator later in life.

Methods: Participants included 620 individuals from a predominantly poor, urban community. Exposure to violence profiles evolved from a latent profile analysis when participants were in their fourth year of high school (M = 17.9 years). Growth models were conducted to determine if latent profiles were predictive of violent perpetration, substance use, and depression during early-adulthood (ages 29.3-32 years). All covariates and dependent variables were imputed using expectation-maximization imputation techniques, and all of these variables were time-varying.

Contributions: By identifying a group of youth who are at high risk of violence perpetration and increasing substance use later in life, we have a better understanding of how violence may manifest in those exposed by violence. With an understanding that the segment of the population is more likely to have increasing substance use and more violence perpetration later in life, interventions could be designed, tailored, and administered once practitioners learn of the violence exposure, to mitigate long-term consequences. Therefore, young persons' risk for long-term health consequences, for reasons completely outside of their capacity, could be mitigated.

References:

Aisenberg, E., Gavin, A., Mehrotra, G., & Bowman, J. (2011). Defining Violence. In T. I. Herrenkohl, E. Aisenberg, J. H. Williams, & J. M. Jenson (Eds.), *Violence in context: Current evidence on risk, protection, and prevention* (pp. 13–26). New York, New York: Oxford University Press.

Anderson, E. (2000). Code of the street: Decency, violence, and the moral life of the inner city.

Aponte, R., Neckerman, K., & Wilson, W. J. (1985). Race, family structure and social policy, 25–27.

Arnett, J. J. (2000a). Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist*, *55*(5), 469.

Arnett, J. J. (2000b). High Hopes in a Grim World Emerging Adults' Views of their Futures and 'Generation X'. *Youth & Society*, *31*(3), 267–286.

Baum, A., Garofalo, J. P., & Yali, A. (1999). Socioeconomic status and chronic stress: does stress account for SES effects on health? *Annals of the New York Academy of Sciences*, *896*(1), 131–144.

Berton, M. W., & Stabb, S. D. (1996). Exposure to violence and post-traumatic stress disorder in urban adolescents. *Adolescence*, *31*(122), 489.

Bronfenbrenner, U. (1986). Recent advances in research on the ecology of human development, 287–309. http://doi.org/10.1007/978-3-662-02475-1

Bronfenbrenner, U., & Morris, P. A. (2007). The bioecological model of human development. In W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology* (Vol. 6). Hoboken, NJ, USA: Wiley Online Library. http://doi.org/10.1002/9780470147658

Centers for Disease Control and Prevention [CDC]. (2015). Web-based Injury Statistics Query and Reporting System (WISQARS). *National Center for Injury Prevention and Control, Centers for Disease Control and Prevention*. Retrieved from http://www.cdc.gov/injury/wisqars/index.html

CDC. (2016). Youth violence: Definitions. *Injury Prevention and Control: Division of Violence Prevention*. Retrieved from http://www.cdc.gov/violenceprevention/youthviolence/definitions.html

Crouch, J. L., Hanson, R. F., Saunders, B. E., Kilpatrick, D. G., & Resnick, H. S. (2000). Income, race/ethnicity, and exposure to violence in youth: Results from the national survey of adolescents. *Journal of Community Psychology*, *28*(6), 625–641.

Dahlberg, L. L. (1998). Youth violence in the United States: Major trends, risk factors, and prevention approaches. *American Journal of Preventive Medicine*, *14*(4), 259–272.

DeNavas-Walt, C., Proctor, B. D., & Smith, J. C. (2014). Income and poverty in the United States: 2013.

Fagan, J., & Wilkinson, D. L. (1998). Social Contexts and Functions of Adolescent Violence. In D. S. Elliott, B. A. Hamburg, & K. R. Williams (Eds.), *Violence in American Schools A New Perspective* (pp. 55–93). New York.

Failla, S., & Jones, L. C. (1991). Families of children with developmental disabilities: An examination of family hardiness. *Research in Nursing & Health*, *14*(1), 41–50.

Feigelman, S., Howard, D. E., Li, X., & Cross, S. I. (2000). The Relationship Among Violence Victimization, Witnessing Violence, and Youth Distress. *Journal of Adolescent Health*, 202–209.

Finkelhor, D., Ormrod, R., Turner, H., & Hamby, S. (2005). The Victimization of Children and

Youth: A Comprehensive, National Survey. *Child Maltreatment*, *10*(1), 5–25. http://doi.org/10.1177/1077559504271287
Finkelhor, D., Turner, H., Ormrod, R., Hamby, S., & Kracke, K. (2009). National survey of children's exposure to violence (pp. 1–11). Juvenile Justice Bulletin.
Finkelstein, D. M., Kubzansky, L. D., & Goodman, E. (2006). Social status, stress, and adolescent smoking. *Journal of Adolescent Health*, *39*(5), 678–685.
Frohlich, K. L., & Potvin, L. (2008). Transcending the known in public health practice: the inequality paradox: the population approach and vulnerable populations. *American Journal of Public Health*, *98*(2), 216–221.
Garbarino, J., Bradshaw, C. P., & Vorrasi, J. A. (2002). mitigating the effects of gun violence on children and youth. *The Future of Children*, *12*(2), 72–85. Retrieved from http://www.jstor.org/stable/1602739
Gee, G. C., & Ford, C. L. (2011). Structural racism and health inequities. *Du Bois Review: Social Science Research on Race*, *8*(01), 115–132.
Hastings, T. L., & Kelley, M. L. (1997). Development and validation of the Screen for Adolescent Violence Exposure (SAVE). *Journal of Abnormal Child Psychology*, *25*(6), 511–520.
Hirsch, A. R. (2009). Making the second ghetto: Race and housing in Chicago 1940-1960.
Khantzian, E. J. (1997). The self-medication hypothesis of substance use disorders: a reconsideration and recent applications. *Harvard Review of Psychiatry*, *4*(5), 231–244.
Khantzian, E. J. (2007). Treating addiction as a human process.

Krug, E. G., Mercy, J. A., Dahlberg, L. L., & Zwi, A. B. (2002). The world report on violence and health. *The Lancet*, *360*. Retrieved from http://www.sciencedirect.com/science/article/pii/S0140673602111330
Lantz, P. M., House, J. S., Lepkowski, J. M., Williams, D. R., Mero, R. P., & Chen, J. (1998). Socioeconomic factors, health behaviors, and mortality: results from a nationally representative prospective study of US adults. *Jama*, *279*(21), 1703–1708.
Mauer, M. (2011). Addressing Racial Disparities in Incarceration. *The Prison Journal*, *91*(3 Suppl), 87S–101S. http://doi.org/10.1177/0032885511415227
McCubbin, M. A., & McCubbin, H. I. (1996). Resiliency in families: A conceptual model of family adjustment and adaptation in response to stress and crises. *Family Assessment: Resiliency, Coping and Adaptation: Inventories for Research and Practice*, 1–64.
Menard, S. W. (2002). Short and long-term consequences of adolescent victimization.
Miranda, R., Meyerson, L. A., Long, P. J., Marx, B. P., & Simpson, S. M. (2002). Sexual assault and alcohol use: Exploring the self-medication hypothesis. *Violence and Victims*, *17*(2), 205–217.
Pearlin, L. I., Schieman, S., Fazio, E. M., & Meersman, S. C. (2005). Stress, health, and the life course: Some conceptual perspectives. *Journal of Health and Social Behavior*, *46*(2), 205–219.
Roberts, M. E., Fuemmeler, B. F., McClernon, F. J., & Beckham, J. C. (2008). Association between trauma exposure and smoking in a population-based sample of young adults. *Journal of Adolescent Health*, *42*(3), 266–274.
Sallis, J. F., Owen, N., & Fisher, E. B. (2008). Ecological models of health behavior. *Health Behavior and Health Education: Theory, Research, and Practice*, *4*, 465–486.

Sanchez, Y. M., Lambert, S. F., & Cooley-Strickland, M. (2013). Adverse life events, coping and internalizing and externalizing behaviors in urban African American youth. *Journal of Child and Family Studies*, *22*(1), 38–47.
Sapolsky, R. M. (2004). Why zebras don't get ulcers: The acclaimed guide to stress, stress-related diseases, and coping-now revised and updated.
Schubiner, H., Scott, R., & Tzelepis, A. (1993). Exposure to violence among inner-city youth. *Journal of Adolescent Health*, *14*(3), 214–219.
Sells, D. J., Rowe, M., Fisk, D., & Davidson, L. (2003). Violent victimization of persons with co-occurring psychiatric and substance use disorders. *Psychiatric Services*.
Shiffman, S. (1993). Assessing smoking patterns and motives. *Journal of Consulting and Clinical Psychology*, *61*(5), 732.
Sickmund, M., & Puzzanchera, C. (2014). *Juvenile offenders and victims: 2014 national report. Office of juvenile justice and delinquency prevention*. Washington DC: ERIC.
Singer, M. I., Anglin, T. M., Yu Song, L., & Lunghofer, L. (1995). Adolescents' exposure to violence and associated symptoms of psychological trauma. *Jama*, *273*(6), 477–482.
Sleet, D. A., Baldwin, G., Marr, A., Spivak, H., Patterson, S., Morrison, C., et al. (2012). History of Injury and Violence as public health problems and emergence of the National Center for Injury Prevention and Control at CDC. *Journal of Safety Research*, *43*(4), 233–247. http://doi.org/10.1016/j.jsr.2012.09.002
Staub, E. (1996). Cultural-societal roots of violence: The examples of genocidal violence and of contemporary youth violence in the United States. *American Psychologist*, *51*(2), 117.
Sullivan, T. N., Kung, E. M., & Farrell, A. D. (2004). Relation between witnessing violence and drug use initiation among rural adolescents: Parental monitoring and family support as protective factors. *Journal of Clinical Child & Adolescent Psychology*, *33*(3), 488–498.
Taylor, S. E., & Stanton, A. L. (2007). Coping resources, coping processes, and mental health. *Annu. Rev. Clin. Psychol.*, *3*, 377–401.
Terr, L. C. (2003). Childhood traumas: An outline and overview, *1*(3), 322–334.
Thoits, P. A. (1995). Stress, coping, and social support processes: Where are we? What next? *Journal of Health and Social Behavior*, 53–79.
Thoits, P. A. (2010). Stress and health major findings and policy implications. *Journal of Health and Social Behavior*, *51*(1 suppl), S41–S53.
Turner, R. J., & Marino, F. (1994). Social support and social structure: A descriptive epidemiology. *Journal of Health and Social Behavior*, 193–212.
Turner, R. J., & Roszell, P. (1994). Psychosocial resources and the stress process, 179–210.
USDHHS. (2001). Youth Violence: A Report of the Surgeon General.
Vermeiren, R., Schwab-Stone, M., Deboutte, D., Leckman, P. E., & Ruchkin, V. (2003). Violence exposure and substance use in adolescents: findings from three countries. *Pediatrics*, *111*(3), 535–540.
Williams, D. R., & Collins, C. (2001). Racial residential segregation: a fundamental cause of racial disparities in health. *Public Health Reports*, *116*(5), 404.
Williams, D. R., Yu, Y., Jackson, J. S., & Anderson, N. B. (1997). Racial differences in physical and mental health socio-economic status, stress and discrimination. *Journal of Health Psychology*, *2*(3), 335–351.
Wills, T. A., & Cleary, S. D. (1996). How are social support effects mediated? A test with parental support and adolescent substance use. *Journal of Personality and Social*

Psychology, *71*(5), 937.
Wills, T. A., & Filer, M. (1996). Stress—coping model of adolescent substance use, 91–132.
Wills, T. A., & Shiffman, S. (1985). Coping and substance use: A conceptual framework. *Coping and Substance Use*, 3–24.
Wilson, W. J. (2012). The truly disadvantaged: The inner city, the underclass, and public policy.
Wordes, M., & Nunez, M. (2002). Our vulnerable teenagers: Their victimization, its consequences, and directions for prevention and intervention. *Oakland, CA: National Council on Crime and Delinquency*.
Wright, R. J. (1998). Exposure to violence. *The British Journal of Psychiatry*, *184*, 169–175.
Zimmerman, M. A., Caldwell, C. H., & Bernat, D. H. (2002). Discrepancy Between Self-Report and School-Record Grade Point Average: Correlates With Psychosocial Outcomes Among African American Adolescents1. *Journal of Applied Social Psychology*, *32*(1), 86–109.

Chapter 2: The Association Between Early Exposure to Violence in Emerging Adulthood and Substance Use in Early-Adulthood Among Inner-City Individuals

Abstract

Background: The objective of this study is to investigate if being exposed to violence early in life is a risk factor for changes in rates of substance use later in life. Roughly half of all youth (8^{th}-12^{th} graders) in the United States have used at least one illicit substance (e.g., tobacco, alcohol, marijuana) in their lifetime. Despite major public health efforts to decrease these trends, those living at or below the poverty line are more likely than the rest of the population to have a substance use disorder. According to the stress-coping model of substance use and the self-medication hypothesis, individuals are more likely to use substances when stressed. African Americans living in urban environments have elevated rates of exposure to violence, a known traumatic event. In some urban, predominately poor African American communities, 81% of youth have been exposed to violence.

Methods: Participants included 850 individuals from a predominately poor, urban community. Exposure to violence was measured four times in subsequent years during emerging adulthood (ages 20-23 years) and substance use was measured four times during early-adulthood (ages 29-32 years). Missing values were imputed with expectation-maximization imputation techniques. Several multilevel growth models were conducted to investigate the relationship between early exposure to violence and later rates of substance use behaviors.

Results: Youth who had above average exposure to violence during emerging adulthood were more likely to have increasing substance use behaviors during early-adulthood. Moreover, above average exposure to violence during emerging adulthood was 1.43, out of a 21-point scale, indicating just two episodes of exposure to violence during emerging adulthood increase one's risk for later substance use.

Implications: These findings may inform intervention development to better protect against the sequelae of exposure to violence, and to these findings could help practitioners tailor interventions to address substance use for those who have been exposed to violence.

Introduction

Despite rates of tobacco and alcohol use at an all-time low in recent history for youth, roughly half of all 8^{th}-12^{th} graders in the United States have used at least one illicit substance in their lifetime (Miech, Johnston, O'Malley, Bachman, & Schulenberg, 2015). Polysubstance use is particularly problematic as those who use more than one substance to achieve a particular effect are more likely to face many repercussions, such as unemployment, sustained substance use and abuse later in life, health complications, and mental health disorders (Dermody et al., 2015; Moss, Chen, & Yi, 2014; Salom, Betts, Williams, Najman, & Alati, 2016). In the general population, 18 out of every 100 adults (25-44 years of age) describe themselves as current smokers (self-reported currently smoking every day or some days), 7 out of every 10 adults have consumed alcohol in the past year, and more than 4 out of every 10 have tried marijuana with 10% being current consumers (Jamal et al., 2014; SAMHSA, 2014; Gallup, 2015). While not every user of such substances will develop a substance use disorder, certain sectors of the population, such as those living in disadvantaged neighborhoods, neighborhoods with high income inequality, or below the poverty line are more likely to be current substance users, suffer from substance use disorders, and poly-substance use disorders (Diez Roux et al., 1997; Galea, Ahern, Tracy, & Vlahov, 2007; Goldmann & Galea, 2014). Individuals who classify themselves as living below the poverty line have higher rates of cigarette use up to nearly 30%, compared to just 16% for those living at or above the poverty line (Jamal et al., 2014). While a positive relationship between alcohol use and income has been reported, researchers have found an inverse relationship between income and alcohol-related problems, such as dependence, and the effect is even stronger when the individual is non-White (Brenner, Diez Roux, Barrientos-

Gutierrez, & Borrell, 2015). Reasons why low-income individuals are more likely to have negative substance using consequences, however, are understudied.

Researchers have found that experiencing stressful events (either chronic or acute), and the psychological or emotional stress that follows, is strongly associated with substance use (Shiffman, 1993). Within the framework of the stress-coping model of substance use, and supported by extensive literature on substance use motives, many adults attribute their substance use to the calming effect that the specific substance provides during stressful situations (Kassel et al., 2007; Shiffman, 1993; Wills & Shiffman, 1985). In the stress-coping model of substance use, the use of substances is a coping response to stress, and substances are used to either heighten positive affect or lower negative affect (Wills & Shiffman, 1985). Thus, those with higher stress and distress, and those with few or no coping resources, are more likely to partake in substance use (Wills & Filer, 1996; Wills & Shiffman, 1985). Indeed, when researchers conduct surveys of adults in the general population, they find that those under higher levels of stress have greater substance use initiation, have higher rates of substance use, and use more of the substance (i.e., smoke more cigarettes, smoke more marijuana, drink more alcohol) (Finkelstein, Kubzansky, & Goodman, 2006; Roberts, Fuemmeler, McClernon, & Beckham, 2008; Sullivan, Kung, & Farrell, 2004; Wills & Cleary, 1996).

A competing or complementary framework that may help explain substance use disparities between those above the poverty line and those living in poverty is the self-medication hypothesis. According to the self-medication hypothesis, heavy substance users engage is consumption as a defense mechanism to protect one's ego and to dull pain (Khantzian, 1997). At first, the substance use is not used as a means for seeking pleasure from the substance, but as an attempt to mitigate the negative repercussions of a negative experience. Overtime, this

adapts into a regular method for seeking refuge from previous harmful experiences and to create an illusion of relief (Khantzian, 2007). When individuals experience psychological pain, their use of substances could sustain into the future as a self-medicated coping mechanism.

Exposure to violence can be a traumatic experience and can result in increased stress (Berton & Stabb, 1996). Among inner-city youth in some American communities, rates of exposure to violence can be as high as 81% (Schubiner, Scott, & Tzelepis, 1993). In fact, violence is now the leading cause of death for young Black males (14-25 years) in the United States (here, Black refers to the several distinct cultures in the U.S. with people of African descent) (CDC, 2014). In addition to the fear of physical trauma due to violence, the long-term effects of exposure to violence can be substantial. In one sample of youth living in a major metropolitan area in the Southern U.S., 29% reported clinical levels of posttraumatic stress disorder (PTSD); further analyses revealed that minority youth who reported PTSD had the highest levels of exposure to violence (Berton & Stabb, 1996). PTSD is a major psychiatric disturbance characterized by pathological responses to exposure to ongoing or single-episode traumatic stress. Symptoms, which may be lifelong, include flashbacks, severe emotional distress, negative changes in thinking and mood, and intensity of emotions (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996).

Several models exist to explain the relationship between stress and substance use. Tension-reduction models suggest that individuals participate in substance use because they believe it will relieve stress, while negative reinforcement models propose that increased stress is predictive of relapse of substance use (Baker, Piper, McCarthy, Majeskie, & Fiore, 2004; Kassel, Stroud, & Paronis, 2003). The stress-coping model and the self-medication hypothesis suggest individual differences exist in how one copes with stress. The models posit that these individual

differences develop during childhood and moderate the complex relationship between substance use and stress (Wills & Shiffman, 1985). Consistent with these models, I hypothesize that the traumatic experience(s) of being exposed to violence may alter one's response to stress and the experience of violence exposure will cause the individual to turn to alcohol, cigarettes, or other substances to cope.

Few researchers have attempted to study an association between exposure to violence and substance use. Vermeiren and colleagues (2003) conducted a three-country study and found an association between witnessing violence and substance use (i.e., cigarette, alcohol, and marijuana use) in Arkangelsk, Russia and Antwerp, Belgium, but not in New Haven, United States. This study, however, was cross-sectional and the sample consisted primarily of 15 year-olds. A longitudinal study is necessary to determine causality because the effects of violence exposure on substance use may take time to develop and substance use behaviors are not static over time (Mistry et al., 2015). Furthermore, Vermeinen and colleagues' measure of violence exposure was limited. They simply asked whether the youth had ever been exposed to six different forms of violence, but the youth could have been exposed to a single form of violence multiple times which was not accounted for in their analysis. Thus, youth exposed to one type of violence 10 times may have received a lower score on their measure than one exposed to two forms of violence once each.

In this study, I focus on how rates of exposure to violence during emerging adulthood (ages 21-25) is predictive of changes in substance use during early-adulthood (ages 28-33). I used these two developmental periods because the former is associated with a time in one's life where their brain is still developing, they are easily influenced, and this stage of development is understudied in terms of long-term repercussions of trauma. I will investigate the relationship

between trajectories of exposure to violence and substance use over time and across stages of development. I examine these relationships using a stress-coping model and the self-medication hypothesis to guide my analysis. I hypothesize that increases in exposure to violence during emerging adulthood will be associated with increases in substance use later in life. I expect this relationship to persist after controlling for mental health, race, sex, socioeconomic status, and substance use early in life.

Methods

Participants

Data used for this study are from the Flint Adolescent Study (FAS). This longitudinal study that began in 1994 consists of 850 ninth graders from the urban city of Flint, Michigan. FAS started as a study of youth at risk for school dropout, so only students with a grade-point average of 3.0 or lower upon entering high school were eligible to participate. Students identified by the schools as having emotional and/or development impairments were not included in the study. Data were collected over twelve nonconsecutive waves and included ages 31-33 in the 12^{th} wave.

The sample included 679 African-American ninth graders (80%), 145 Whites (17%), and 26 mixed African-American and white (3%). Individuals self-identified their race/ethnicity. The sample contained an equal number of males and females. Both sexes were of similar age at the start of the study (Males: $M = 14.93$, $SD = 0.66$; Females: $M = 14.79$, $SD = 0.62$). For the purposes of this study, those who identified as African-American or mixed were collapsed into one group.

For the current study, emerging adulthood included waves 5-8 (2000-2005), and early-adulthood included waves 9-12 (2007-2012). The final analysis included 850 participants. Missing values were imputed (see analysis section for further details).

Procedures

Trained research assistants collected data through structured face-to-face interviews and through a self-administered pencil and paper portion. The face-to-face interview portion collected data on education, support, psychosocial, and other non-threatening variables. The self-administered portion collected data on more sensitive data such as substance use, sexual behavior, and violence. Each survey/interview took between 90-120 minutes to complete.

The University of Michigan Institutional Review Board approved this study.

Measures

Means and standard deviations from all study variables of interest are presented in Table 1.

Demographics.

Individuals self-identified their sex and race. Family socioeconomic status at wave 4 was assessed using a parental occupational prestige rating (Nakao & Treas, 1992). Research assistants asked participants to report the occupations of their mother and father (or guardian), and that occupation was then assigned a prestige score. The highest occupational group is equivalent to professional/specialty and the lowest group is equivalent to private household work, and the higher the prestige score, the higher the level of socioeconomic status. If youth reported occupations for both parents, I included only the highest score for analysis purposes. If both parents were unemployed, they received a zero for SES. This covariate was included because researchers have found a relationship between poverty and substance use (Vermeiren, Schwab-Stone, Deboutte, Leckman, & Ruchkin, 2003).

Substance use.

Cigarette, alcohol, and marijuana use in the past 30 days were assessed using three separate questions. Each item asked how often they had used that specific substance in the past 30 days. Response options range from "not at all" to "two packs or more per day" for the cigarette question and to "40+ times" for alcohol and marijuana use. Scores for each item range from 1 to 7. The higher the score, the more often they used that specific substance. These questions are the same used in the Monitoring the Future Study (Johnston, 2010). Time-varying covariates of cigarette, alcohol, and marijuana use during four waves of emerging adulthood were included separately as covariates (waves 5-8). The dependent variable is an index of the sum of all three of these variables at each wave from 9-12. This item has a range of 0-21, with the higher score pertaining to more substance use. The outcome of this study is the substance use as a slope from waves 9-12 when the sample was 26-33 years old.

Exposure to violence.

The exposure to violence scale is the average of five items that measured if the participant had observed or experienced violence over the last 12 months (Stoddard, Heinze, Choe, & Zimmerman, 2015). Examples items include: "had someone physically assaulted or hurt you?" and "had you seen someone commit a violence crime where someone was hurt?" Items included 5 response options ranging from 0 times to 4+ times. Cronbach alphas for the four waves included in this analysis (waves 5-8) ranged from .71 to .75.

Depressive symptoms.

Depressive symptoms was measured using the Brief Symptom Index (Derogatis & Spencer, 1993). This measure is the average of six items that assessed symptoms during the past week including thoughts of ending your life, feeling lonely, and feeling blue. Items were recoded so

that a score of 5 reflected greater depressive symptoms, and a score closer to 1 reflected little to no depressive symptoms. Depressive symptoms between waves 5 and 8 were included as a covariate because researchers have reported a strong relationship between depression during any stage of life and subsequent smoking behaviors (Anda et al., 1999). The Cronbach for the depressive symptoms measure from waves 5 to 8 ranged from .83 to .87.

Analysis

To investigate the differences in substance use trajectories, I fit a series of multilevel growth models. First, I fitted a model with time as a predictor of substance use with an associated random effect (model 1). I attempted to fit a model with time as a linear variable, and time as a quadratic variable (see table 2). Next, fixed effects were added to the model (i.e., substance use in emerging adulthood: alcohol, cigarettes, marijuana, depression, income, race, and sex) (model 2). The third model includes exposure to violence as a time-varying variable during emerging adulthood as a predictor of individuals' substance use during early-adulthood above and beyond the covariates. Lastly, the interaction of exposure to violence in early-adulthood and time was added to the model as a predictor of the trajectory of later substance use (model 4). This analysis allowed us to examine if rates of exposure to violence during one stage of life can be associated with the trend of substance use in a later stage of life, above and beyond several covariates. These analyses were conducted using STATA (version 13.1). Missing values were imputed with expectation-maximization imputation techniques using EQS and 17.8% of the cases were imputed (version 6.3).

Results

Growth model estimates of all fixed effects, estimated variances of the random effects, and fit indices are reported in Table 2. In the first regression model I performed, time (linear)

was not associated with substance use, $b = .04$, $t(848) = .75$, $p = .46$. Given my theoretical developmental framework, however, I decided to conduct additional analyses. When the covariates were included in the model (model 2), alcohol ($b = .14$, $t(841) = 2.82$, $p = .005$) and marijuana ($b = .24$, $t(841) = 5.43$, $p \leq .001$) use during emerging adulthood were all predictive of the main effect of substance use in early-adulthood. Additionally, those who identified as Black ($b = -.91$, $t(841) = -3.41$, $p \leq .001$), and male ($b = -.55$, $t(841) = -2.78$, $p = .005$) were more likely to have a lower substance use in early-adulthood. In the next model (model 3), I added exposure to violence during emerging adulthood, and this was not a significant predictor of later substance use. See Table 2 for random effects findings.

I decided to run a final model given the theoretical justification and included an interaction term of exposure to violence during emerging adulthood and time (model 4). The interaction term predicted the slope of substance use during early-adulthood, above and beyond the other covariates included in the model, $b = .32$, $t(839) = 3.38$, $p \leq .001$ (Table 2). When looking at different levels of exposure to violence, one's risk of substance use during emerging adulthood changes (Table 3). In decomposing the interaction term, exposure to high rates of violence (above the mean) during emerging adulthood is associated with an increase in substance use during early-adulthood, and little to no exposure to violence during emerging adulthood is associated with a decreasing trend in substance use during early-adulthood, although the latter only approaches significance (Figure 1).

Discussion

My results are consistent with the stress-coping model and the self-medication hypothesis because those with above average rates of exposure to violence in emerging adulthood had an increasing trend in substance use in early-adulthood. Late-adolescence and emerging adulthood

are vulnerable times for a young person's development. During this time of life, researchers have documented considerable neural growth and connectivity changes occurring in the prefrontal cortex (PFC) (Sabbagh, 2006). This part of the brain is responsible for decision making (Sabbagh, 2006). As the PFC is highly malleable, the development of the PFC could be altered by any form of trauma (e.g., exposure to violence) (Sabbagh, 2006). It is possible that the exposure to violence that our participants experienced during emerging adulthood altered the highly malleable PFC, forcing their reward sensitivity to continue to change, which could be associated with changes in substance use later in life. The exposure to violence they experienced early in life may have dulled their reward sensitivity, thereby increasing their need for greater substance use. Future research could further explore this theory through FMRI studies.

The relationship between exposure to violence during emerging adulthood and substance use during early-adulthood is not congruent with what Vermeiren and colleagues (2003) found in their American sample, but is consistent with what they found for their Russian and Belgium samples. Vermeiren et al. (2003) called for this research question to be tested using a prospective research design in future studies. It is possible the two studies did not find the same conclusions because we had different American samples. Perhaps Flint was more violent and disadvantaged than the New Haven sample. Another explanation for these divergent findings the Vermeiren et al. study was only cross-sectional. Moreover, we may have found different findings because our research questions are slightly different. I looked at the slopes of substance use over time, whereas Vermeiren and colleagues explored substance use in a binary fashion with logistic regression. In addition, the measures used in the studies were somewhat different. Vermeiren et al asked participants to recall being exposed to violence, or their victimization, over the past two years, while my measure focused only on the last year. Lastly, respondents in the Vermeiren et

al. study reported only yes or no to a list of exposures, while in my study, respondents were asked to report the frequency of their exposures to violence.

While those who were exposed to violence more frequently than the sample's average amount of exposure were more likely to have increasing substance use in early-adulthood, the remarkable aspect of this finding is merely two episodes of exposure to violence during emerging adulthood were associated with increasing substance use in early-adulthood. Most participants in this study had a relatively low exposure to violence during emerging adulthood, with the mean of exposure to violence across all 4 waves of data at 1.43, out of a possible 21. Therefore, we have further support that exposure to violence can be a traumatic experience and can result in lasting effects (Berton & Stabb, 1996; Nemeroff, 2004).

Limitations of the current study should be noted. First, the sample only included urban youth who entered 9th grade with low academic achievement. Poor academic achievement is a risk factor for substance use (Bryant, Schulenberg, Bachman, O'Malley, & Johnston, 2000). Yet, by the time students in the sample were in their senior year of high school, academic performance was more normally distributed (Zimmerman, Caldwell, & Bernat, 2002). Second, respondents self-reported their exposures to violence and substance use behaviors throughout all waves of data collection. These responses may have been influenced by social desirability bias or response recall. We attempted to maintain complete privacy and ensured the participants that their responses would be kept confidential, as almost all researchers measuring behaviors in a general population study have done. Additionally, substance use and violence questions were captured through the self-administered portion of the interview, not through the face-to-face portion, further protecting against social desirability bias. Third, our exposure to violence measure only included five items assessing if the participant had either witnessed or been a

victim to different forms of violence. To capture exposures to chronic and acute forms of violence in a community and society, a more robust measure is needed, such as exposure to media violence. By having an exposure to violence measure that captures multiple domains of violence, we can have a more accurate picture of exposure to violence and a stronger measure overall. Nevertheless, the five items used to measure exposure to violence in the past 12 months captured many serious and salient events. The results of this study, however, provide evidence that more studies of the effects of violence exposure on substance use are needed. Future research that includes other forms of exposure to violence such as media violence may be especially useful. Additionally, further research should explore other substances not included in the analysis such as e-cigarettes, prescription drug overuse, and chewing tobacco.

Despite these limitations, this study added to our understanding of the effects of violence exposure in a number of ways. First, our sample is mostly low-income, Black individuals. Due to the lack of resources in their community, the high rates of violence in their city, and a high poverty rate, this sample is at a particularly high risk for violence. This is a unique sample that is historically understudied. With more studies in similar diverse samples, we can begin to start applying lessons learned to other populations. Second, the longitudinal nature of this study helps establish support for a covariation between variables and a temporal order of variables—thereby enhancing causal inference. Therefore, with other longitudinal studies looking at similar research questions, we can begin to apply causality between exposure to violence at one point in life and trends in substance use later in life. We can see that exposure to violence during one developmental stage may effect substance use in a later developmental stage.

Implications for Practice.

The findings of this study suggest that practitioners may want to tailor existing adult substance use interventions for those exposed to violence when they were younger. By screening for exposure to violence when an individual enters a substance used treatment program, practitioners may be able to tailor the treatment plan to include positive coping strategies, alternative self-medicating lessons, and other evidence-based treatment procedures.

Furthermore, to protect the health and wellbeing of those exposed to violence from subsequent substance use, prevention programs that focus on those exposed to violence could address cigarette, tobacco, and marijuana use. The results of this study suggest that a cognitive-behavioral stress management intervention where participants learn how to evaluate their primary appraisals of their experience, evaluate their coping resources, and work on increasing their resources may be beneficial (Cohen, Mannarino, Berliner, & Deblinger, 2000). A modified intervention might also focus on substance use, in additional to the other foundational components of cognitive-behavioral therapy. The overall goal of the cognitive-behavioral intervention would be for the individual who was exposed to violence to learn how to appropriately and safely cope with the stress caused by the exposure to violence and not increase their substance use. This form of intervention has been shown effective at reducing stress, anxiety, and depression following being a victim of violence, but to my knowledge, has not been evaluated specifically for substance use following a violent experience beyond victimization. A modified intervention could be modeled on the Substance Dependence Posttraumatic Stress Disorder Theory, which is a two-phase, 20-week individual therapy that integrates cognitive-behavioral and coping skills treatment for substance use for individuals with posttraumatic stress disorder (Triffleman, Carroll, & Kellogg, 1999). Yet, the intervention would have to be modified and perhaps implemented in an alternative setting, as our sample lives in a community that

makes it difficult to attend 20 weeks of individual therapy due to several structural issues (e.g., reliable public transportation system, lack of funds for extra childcare, many residents working more than one part-time job).

The findings from our study could also inform interventions that go beyond the individual level. These interventions (e.g., school-based programs, social media campaigns, local and state policies) could address exposure to violence, especially if they are working with a population that is known for having high rates of community violence. In such communities, the coping response of substance use behavior may be missed in traditional substance use interventions, and exposure to violence may actually be a main driver for the substance use. Unfortunately, violence is ubiquitous in some communities and substance use interventions need to take the consequences of violence exposure into account.

Those most at risk of violence and its consequences could also benefit from policy and decision makers using an evidence-based approach to address youth violence. Policymakers could use these findings to prioritize funding for substance use prevention in those communities with the highest rates of violence. Additionally, the link between exposure to violence and later increases in substance use reinforces the need for increased funding for community intervention from a chronic disease perspective, as substance use is a predictor to many forms of chronic illness.

Table 2.1. Descriptive statistics for study variables

Average over emerging adulthood waves (waves 5-8)	**Mean (sd)**
Cigarette use	1.15 (5.44)
Alcohol use	1.60 (1.55)
Marijuana use	1.67 (1.82)
Depression	1.78 (.85)
Poverty	39.9 (9.78)
Exposure to violence	1.43 (0.53)
Average over early-adulthood waves (waves 9-12)	
Substance use	2.94 (4.03)

Table 2.2. Summary of multilevel mixed-effects linear regression analysis for covariates predicting substance use in early-adulthood (*N* = 850)

Parameter	Model 1	Model 2	Model 3	Model 4
Intercept	2.88	3.41	3.28	3.85
	(.12)	(.52)	(.54)	(.57)
Level 1				
Time	.04	.02	.02	-.44**
	(.05)	(.05)	(.05)	(.09)
Level 2				
Cigarette use in early-adolescence		-.01	-.01	-.01
		(.01)	(.01)	(.10)
Marijuana use in early-adolescence		.24***	.24***	.24***
		(.04)	(.05)	(.04)
Alcohol use in early-adolescence		.14**	.14**	.13**
		(.05)	(.05)	(.05)
Depression in early-adolescence		.16	.15	.16
		(.12)	(.12)	(.12)
Black		-.91***	-.91***	-.92***
		(.27)	(.27)	(.27)
Male		-.55**	-.58**	-.58**
		(.20)	(.27)	(.20)
Poverty in early-adolescence		-.01	-.01	-.01
		(.01)	(.01)	(.01)
Exposure to Violence during emerging adulthood			.12	-.29
			(.01)	(.18)
Exposure to Violence during emerging adulthood* time				.32***
				(.09)
Random effects				
Intercept (τ_{00})	6.50***	5.48***	5.50***	5.54***
Time (τ_{10})	.23***	.20***	.20***	.19***
Residual (σ^2)	8.93***	9.09***	9.07***	9.03***
Fit index				
Log likelihood	-9210.3	-9172.8	-9172.4	-9166.7

* $p \leq .05$
** $p \leq .01$
*** $p \leq .001$

Table 2.3. Summary of interaction effects of exposure to violence for predicting later substance use

Parameter	Model 1: Low Exposure to Violence (N = 511)	Model 1: High Exposure to Violence (N = 339)
Intercept	3.09 (.15)	2.57 (.20)
Level 1		
Time	-.09 (.06)	0.22 (.09)**

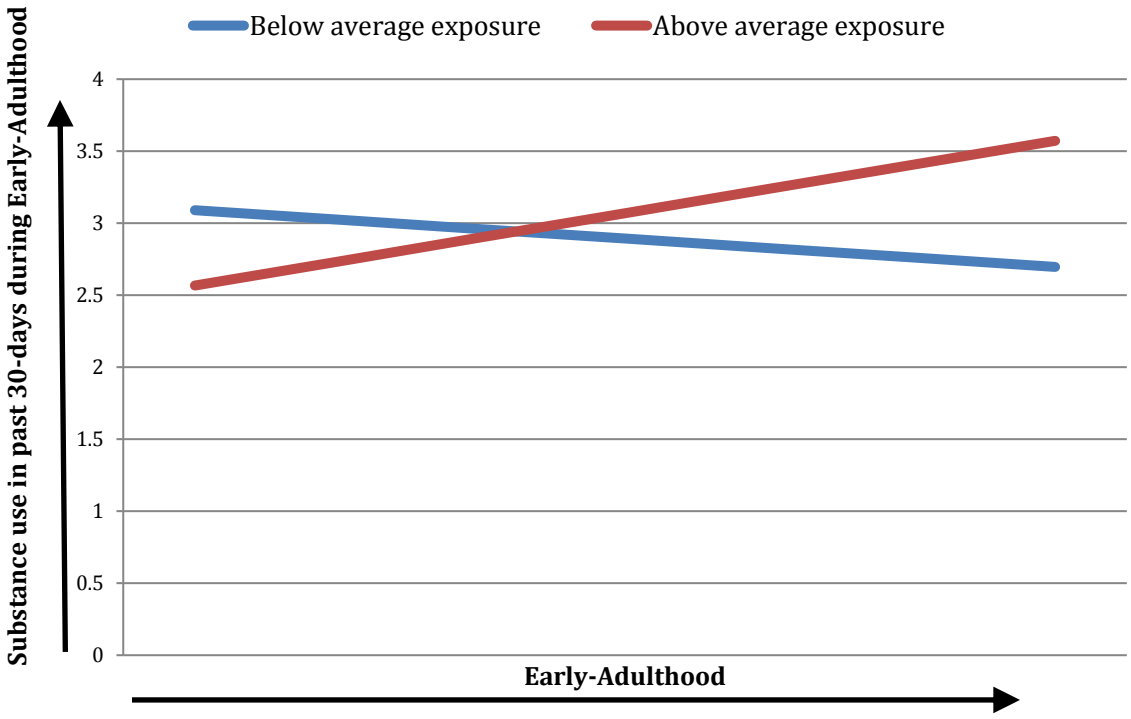
Note: Low and high exposure to violence membership was determined by individual average exposure to violence scores during emerging adulthood falling below and above the sample mean score (1.43), respectively.

* $p \leq .05$

** $p \leq .01$

*** $p \leq .001$

Figure 1. Relationship between exposure to violence during emerging-adulthood and substance use during early-adulthood, as conditioned by level of exposure to violence



References:

Anda, R. F., Croft, J. B., Felitti, V. J., Nordenberg, D., Giles, W. H., Williamson, D. F., & Giovino, G. A. (1999). Adverse childhood experiences and smoking during adolescence and adulthood. *Jama*, *282*(17), 1652–1658.

Baker, T. B., Piper, M. E., McCarthy, D. E., Majeskie, M. R., & Fiore, M. C. (2004). Addiction motivation reformulated: an affective processing model of negative reinforcement. *Psychological Review*, *111*(1), 33.

Berton, M. W., & Stabb, S. D. (1996). Exposure to violence and post-traumatic stress disorder in urban adolescents. *Adolescence*, *31*(122), 489.

Blanchard, E. B., Jones-Alexander, J., Buckley, T. C., & Forneris, C. A. (1996). Psychometric properties of the PTSD Checklist (PCL). *Behaviour Research and Therapy*, *34*(8), 669–673.

Brenner, A. B., Diez Roux, A. V., Barrientos-Gutierrez, T., & Borrell, L. N. (2015). Associations of alcohol availability and neighborhood socioeconomic characteristics with drinking: cross-sectional results from the Multi-Ethnic Study of Atherosclerosis (MESA). *Substance Use & Misuse*, *50*(12), 1606–1617.

Bryant, A. L., Schulenberg, J., Bachman, J. G., O'Malley, P. M., & Johnston, L. D. (2000). Understanding the links among school misbehavior, academic achievement, and cigarette use: A national panel study of adolescents. *Prevention Science*, *1*(2), 71–87.

Centers for Disease Control and Prevention [CDC]. (2014). Web-based Injury Statistics Query and Reporting System (WISQARS). *National Center for Injury Prevention and Control, Centers for Disease Control and Prevention*. Retrieved from http://www.cdc.gov/injury/wisqars/index.html

Cohen, J. A., Mannarino, A. P., Berliner, L., & Deblinger, E. (2000). Trauma-focused cognitive behavioral therapy for children and adolescents an empirical update. *Journal of Interpersonal Violence*, *15*(11), 1202–1223.

Dermody, S. S., Marshal, M. P., Cheong, J., Chung, T., Stepp, S., & Hipwell, A. (2015). Risk of polysubstance use and co-occurring internalizing and externalizing symptoms among adolescent sexual minority girls. *Drug and Alcohol Dependence*, *146*, e263.

Derogatis, L. R., & Spencer, P. M. (1993). Brief symptom inventory: BSI.

Diez Roux, A. V., Nieto, F. J., Muntaner, C., Tyroler, H. A., Comstock, G. W., Shahar, E., et al. (1997). Neighborhood environments and coronary heart disease: a multilevel analysis. *American Journal of Epidemiology*, *146*(1), 48–63.

Finkelstein, D. M., Kubzansky, L. D., & Goodman, E. (2006). Social status, stress, and adolescent smoking. *Journal of Adolescent Health*, *39*(5), 678–685.

Galea, S., Ahern, J., Tracy, M., & Vlahov, D. (2007). Neighborhood income and income distribution and the use of cigarettes, alcohol, and marijuana. *American Journal of Preventive Medicine*, *32*(6), S195–S202.

Gallup (2015). More than four in 10 Americans say they have tried marijuana. *Gallup Poll, October 2015*. Retrieved from: http://www.gallup.com/poll/184298/four-americans-say-tried-marijuana.aspx.

Goldmann, E., & Galea, S. (2014). Mental Health Consequences of Disasters. *Annual Review of Public Health*, *35*(1), 169–183. http://doi.org/10.1146/annurev-publhealth-032013-182435

Jamal, A., Agaku, I. T., O'Connor, E., King, B. A., Kenemer, J. B., & Neff, L. (2014). Current cigarette smoking among adults—United States, 2005–2013. *MMWR Morb Mortal Wkly Rep*, *63*(47), 1108–1112.

Johnston, L. D. (2010). Monitoring the Future: National Survey Results on Drug Use, 1975-2008:

Volume II: College Students and Adults Ages 19-50. DIANE Publishing.
Kassel, J. D., Evatt, D. P., Greenstein, J. E., Wardle, M. C., Yates, M. C., & Veilleux, J. C. (2007). The acute effects of nicotine on positive and negative affect in adolescent smokers. *Journal of Abnormal Psychology*, *116*(3), 543.
Kassel, J. D., Stroud, L. R., & Paronis, C. A. (2003). Smoking, stress, and negative affect: correlation, causation, and context across stages of smoking. *Psychological Bulletin*, *129*(2), 270.
Khantzian, E. J. (1997). The self-medication hypothesis of substance use disorders: a reconsideration and recent applications. *Harvard Review of Psychiatry*, *4*(5), 231–244.
Khantzian, E. J. (2007). Treating addiction as a human process.
Miech, R. A., Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2015). Monitoring the Future national survey results on drug use, 1975–2014: Volume I, Secondary school students. *Ann Arbor, MI: Institute for Social Research, the University of Michigan*.
Mistry, R., Heinze, J. E., Cordova, D., Heish, H.-F., Goldstick, J. E., Ayer, S. M., & Zimmerman, M. A. (2015). Transitions in Current Substance Use from Adolescence to Early-Adulthood. *Journal of Youth and Adolescence*, 1–13.
Moss, H. B., Chen, C. M., & Yi, H.-Y. (2014). Early adolescent patterns of alcohol, cigarettes, and marijuana polysubstance use and young adult substance use outcomes in a nationally representative sample. *Drug and Alcohol Dependence*, *136*, 51–62.
Nakao, K., & Treas, J. (1992). The 1989 socioeconomic index of occupations: Construction from the 1989 occupational prestige scores.
Nemeroff, C. B. (2004). Neurobiological consequences of childhood trauma. *Journal of Clinical Psychiatry*, *65*(Suppl. 1), 18–28.
Roberts, M. E., Fuemmeler, B. F., McClernon, F. J., & Beckham, J. C. (2008). Association between trauma exposure and smoking in a population-based sample of young adults. *Journal of Adolescent Health*, *42*(3), 266–274.
Sabbagh, L. (2006). The teen brain, hard at work. *Scientific American Mind*, *17*(4), 20–25.
Salom, C. L., Betts, K. S., Williams, G. M., Najman, J. M., & Alati, R. (2016). Predictors of comorbid polysubstance use and mental health disorders in young adults—a latent profile analysis. *Addiction*, *111*(1), 156–164.
Schubiner, H., Scott, R., & Tzelepis, A. (1993). Exposure to violence among inner-city youth. *Journal of Adolescent Health*, *14*(3), 214–219.
Shiffman, S. (1993). Assessing smoking patterns and motives. *Journal of Consulting and Clinical Psychology*, *61*(5), 732.
Stoddard, S. A., Heinze, J. E., Choe, D. E., & Zimmerman, M. A. (2015). Predicting violent behavior: the role of violence exposure and future educational aspirations during adolescence. *Journal of Adolescence*, *44*, 191–203.
Substance Abuse and Mental Health Services Administration [SAMHSA]. (2014). Mental Health Services Administration.(2013) Results from the 2012 National Survey on Drug Use and Health: Summary of National Findings (No. NSDUH Series H-46, HHS Publication No.(SMA) 13–4795).*Rockville, MD: Substance Abuse and Mental Health Services Administration*.
Sullivan, T. N., Kung, E. M., & Farrell, A. D. (2004). Relation between witnessing violence and drug use initiation among rural adolescents: Parental monitoring and family support as protective factors. *Journal of Clinical Child & Adolescent Psychology*, *33*(3), 488–498.
Triffleman, E., Carroll, K., & Kellogg, S. (1999). Substance dependence posttraumatic stress disorder therapy: An integrated cognitive-behavioral approach. *Journal of Substance Abuse*

Treatment, *17*(1), 3–14.
Vermeiren, R., Schwab-Stone, M., Deboutte, D., Leckman, P. E., & Ruchkin, V. (2003). Violence exposure and substance use in adolescents: findings from three countries. *Pediatrics*, *111*(3), 535–540.
Wills, T. A., & Cleary, S. D. (1996). How are social support effects mediated? A test with parental support and adolescent substance use. *Journal of Personality and Social Psychology*, *71*(5), 937.
Wills, T. A., & Filer, M. (1996). Stress-coping model of adolescent substance use, 91–132.
Wills, T. A., & Shiffman, S. (1985). Coping and substance use: A conceptual framework. *Coping and Substance Use*, 3–24.
Zimmerman, M. A., Caldwell, C. H., & Bernat, D. H. (2002). Discrepancy Between Self-Report and School-Record Grade Point Average: Correlates With Psychosocial Outcomes Among African American Adolescents1. *Journal of Applied Social Psychology*, *32*(1), 86–109.

Chapter 3: Exposure to Violence—A Latent profile Analysis: Victimization, Observation, and Family Conflict in a Young Inner-City Disadvantaged Sample

Abstract

Background: The objective of this study is to identify different profiles of violence exposure and examine how the different patterns of exposure may differ by demographic characteristics (e.g., gender, ethnicity) and violence perpetration. Exposure to violence is the most frequently reported stressor in the lives of African American youth. In some communities, rates of exposure to violence for young persons are as high as 81%. While many researchers state that exposure to violence is associated with many later detrimental health effects, the measures of exposure to violence used to study these relationships are often poor, and the study designs are weak. For example, most measures do not consider the fact that many individuals are exposed to multiple forms of violence concurrently. Studies that simply sum multiple forms of exposure to violence fail to differentiate individuals who are experiencing unique exposure to violence profiles, and individuals may not be receiving appropriate intervention.

Methods: Participants included 770 youth (M = 17.9 years) from a disadvantaged community. Youth were asked several items to measure their levels of family conflict, amount of violence they have observed, and violent victimization. Multiple latent profile analyses were performed to find classes with the best fit. Additionally, groups were compared using ANOVAs and chi-squares to determine differences in demographics and violence perpetration.

Results: A latent profile analysis indicated that a three group solution provided the best fit. These three groups included participants with universal low exposures to violence, a group with medium exposures to violence, and a group with high exposure to violence across all exposure to violence measures. Additionally, post hoc analyses indicated that male were more likely than

females to be in the high exposure to violence group, and a positive relationship between the level of exposure to violence and self-reported violence perpetration.

Potential Implications: These findings could allow researchers to be better prepared to tailor interventions that protect against the repercussions of different forms of concurrent types of exposure to violence.

Introduction

Violence is ubiquitous in American society. In fact, the most frequently reported stressor in the lives of African American youth is exposure to violence (Sanchez, Lambert, & Cooley-Strickland, 2013). Depending on one's social class, race, and community, different forms of exposure to violence are more common. For example, in some American neighborhoods, up to 81% of youth have been exposed to violence in their community (Dempsey, Stacy, & Moely, 2000). In one study of a similar population, every youth interviewed knew someone who was a victim of violence (Schubiner, Scott, & Tzelepis, 1993). Youth can also be exposed to violence in their own household. Black youth are three times more likely to suffer from child abuse or neglect, and are also more likely to witness other forms of violence in their family, relative to other subgroups of the population (*Crime in the United States*, 2013). The Office of Juvenile Justice and Delinquency Prevention (2009) found that nearly half of their respondents were victimized at least once in the past year (Finkelhor, Turner, Ormrod, Hamby, & Kracke, 2009). In fact, the leading cause of death for young Black men is homicide (Centers for Disease Control and Prevention, 2015).

Exposures to certain types of violence increase the risk of experiencing other forms of violence (Krug, Mercy, Dahlberg, & Zwi, 2002). In communities with high rates of violence, it is likely for an individual to experience violence across multiple settings (Lambert, Nylund-Gibson, Copeland-Linder, & Ialongo, 2010). Yet, much of the research on exposure to violence does not account for unique patterns of exposure, and instead, treats different patterns of exposure similarly (Wright, 1998). In other words, studying each individual's violent experience in isolation may not adequately represent that individual's experience. If we can identify youth who report similar types of exposure to violence profiles, we may be able to develop better

interventions to help youth cope with stressful life events and mitigate the negative repercussions the exposures may cause. Thus, one goal of this study is to identify youth with similar patterns of violence exposure and explore risk factors for these exposures to violence profiles.

Exposure to violence

Few researchers have explored the patterning of violence, especially violence exposure in a sample that is at high risk of violence during their high school years. Previously, researchers have used cluster analysis to group individuals based on similar victimization experiences. Felix and McMahon (2006), for example, conducted a cluster analysis with 73 6-8th graders from Chicago to explore multiple forms of victimization (e.g., physical/verbal, relational, sexual harassment). They identified four groups including (1) low levels of victimization (n = 57), (2) mostly relational and directly physical/verbal victimization (n = 3), (3) bully-victims with high levels of sexual harassment (n = 4), and (4) predominantly relational victimization and sexual harassment (n = 9). While their cluster analysis is informative, the small sample limits generalizability of their study, and weakens the power of their findings (Felix & McMahon, 2006). Lambert and colleagues (2010) examined patterns of exposure to violence using latent class analysis, a procedure that includes statistical fit indices, allowing researchers to better decide the number of groups/classes. They surveyed 6, 7, and 8 graders from Baltimore about their experiences of witnessing violence in their community and being victimized. Lambert et al. found two groups for each of the three grades: high exposure and low exposure. The high exposure group included high rates of witnessing someone being beaten up, robbed, or killed. The other items (i.e., being the victim of robbery, beating, or shooting) did not yield a difference between the two groups. The authors called for future studies to replicate their findings in different contexts and to include more types of violence exposure (Lambert et al., 2010). Walsh,

Senn, & Carey (2012) studied different profiles of violence exposures using a robust set of variables. They included scales of childhood maltreatment, intimate partner violence, and exposure to community violence. Using latent class analysis they found four groups: (1) low violence, (2) mainly exposure to community violence, (3) mainly childhood maltreatment, and (4) multiple forms of violence. Their study population included mostly single women at a publicly funded STD clinic, where nearly half of the participants were unemployed. The current study will take an approach similar to Walsh & colleagues (2012) and use a robust set of exposure to violence variables, studying a sample of 12th graders from a low-income community with significant violent crime.

The current study

Based on previous work, we know that exposure to violence is linked to many negative outcomes (Berton & Stabb, 1996). Yet, few researchers have examined how different types of exposure to violence may cluster among one another. Measures of exposure to violence tend to be narrow in scope and focus on only one specific domain (e.g., witnessing, victimization, or family conflict) (Aisenberg, Gavin, Mehrotra, & Bowman, 2011; Terr, 2003). When researchers do include multiple exposure to violence domains, most simply sum binary items to produce an overall exposure to violence score (Wright, 1998). This analytical approach is problematic as it loses information on the differential effect of experiencing acute versus chronic exposures, and cannot capture the effect of salient versus less prominent events. Examination of profiles of exposure to different kinds of violence across different ecological levels and assessed in a more continuous way other than presence or absence can help us better understand the ecology of exposure and how different systems in an adolescent's life may interact to create different kinds of consequences for development. This approach will examine how multiple forms of violence

may cluster together to form risk. It also provides a framework for studying how different profiles of exposure may change over time. This approach will also allow us to study how different patterns of violence exposure early in life may contribute to health consequences later in life.

To identify exposure to violence profiles in a sample of high-risk, predominately African American 12th graders, I will use latent profile analysis. The observed variables used for the profiles include the three main domains of violence (i.e., family conflict, witnessing, victimization). Collectively, these three domains of violence exposure are the most frequently experienced and the most studied (Butchart, Mikton, Dahlberg, & Krug, 2015; Dahlberg, 1998; Krug, Mercy, Dahlberg, & Zwi, 2002). Yet, most researchers have studied these three types of exposures independently even though the shared risk factors of these forms of violence exposure (e.g., poverty, high rates of community violence, weak school attachment) suggest that different exposures to violence could be ongoing concurrently and interact to create different consequences.

I will compare different exposure groups by demographic variables (e.g., race, SES, sex) because race, SES, and sex are predictive of health disparities from both a single variable and an intersectional perspective (Andersen & Collins, 2015; Gee & Ford, 2011). If individuals with shared characteristics cluster in similar exposure to violence profiles, we could get a better understanding of certain subgroups of the populations who are at increased risk.

From a theoretical perspective, youth who are exposed to violence, and see others benefit from the use of violence, should be more likely to commit a violent act (Bandura, 1973; Huesmann, 1988). Researchers have tested this relationship and have yielded inconclusive findings (Hastings & Kelley, 1997; Krug, Mercy, Dahlberg, & Zwi, 2002; Wright, 1998). I will

test if violence perpetration differs across exposure to violence profiles to better understand the relationship between exposure to violence and perpetration.

Methods

Participants

The data for this study were collected as part of the Flint Adolescent Study (FAS). Beginning in 1994, this longitudinal study enrolled of 850 ninth graders from Flint, Michigan. The longitudinal study began as an analysis of youth at risk for school dropout; consequently, only students with a grade-point average of 3.0 or lower upon entering high school were eligible to participate. Additionally, only students identified by the schools as not having emotional and/or development impairments were included in the study. Researchers collected data over twelve different years (ages 14-33 years old over the study period).

In the initial sample, participants self-reported their race/ethnicity and included 679 African-American ninth graders (80%), 145 Whites (17%), and 26 mixed African-American and white (3%). Both sexes were equally represented in the sample and they were of similar age (Males: $M = 14.93$, $SD = 0.66$; Females: $M = 14.79$, $SD = 0.62$). Due to sample sizes, those who identified as African-American or mixed were collapsed into one group.

Latent profile analysis was performed with data from wave 4 (1998) when participants averaged 18 years old (N = 770). Out of the 12 waves of data, I chose wave 4 for several reasons. At this wave, persons aged 18-21 are the most likely to be a victim of a serious violent crime (Perkins, 1997). Moreover, during this stage of development, the prefrontal cortex, which is responsible for decision-making and reward sensitivity, is still forming and can be easily influenced (Sabbagh, 2006). Consequently, the youth at this age are most likely to take risks to seek out rewards, which can put them at increased risk for exposure to violence.

Procedures

Trained research assistants collected non-threatening data through structured face-to-face interviews (e.g., family factors, social support, attitudes). For more sensitive questions (e.g., alcohol and drug use, sexual activity, violence) participants completed a self-administered questionnaire at the end of the interview.

The University of Michigan Institutional Review Board approved this study.

Measures

Means and standard deviations from all study measures are presented in Table 1.

Exposure to violence—family conflict.

Five questions measured each participant's family conflict (Moos & Moos, 1994). When asked about their family, respondents had four response options (1 = hardly ever, 4 = often). The participants were asked to assess their family as a whole for the following items: "we fight in our family," "family members get so angry they throw things," and "family members lose their tempers." Mean stability coefficients between .66 to .91 have been reported by the scale developers, and despite some criticism related to the internal reliability of some subscales, the scale has been used extensively in family research and the scale has been independently validated several times with many different samples (Boyd, Gullone, Needleman, & Burt, 1997; R. H. Moos & Moos, 1994). The scale covers a broad range of family conflict, allowing for a more accurate measure of various forms of family conflict. For the current study, the family conflict items had a Cronbach alpha of .81.

Exposure to violence—observation.

Participants were asked to report the frequency of witnessing violent acts over the past 12 months through two questions: Had they "seen someone commit a violent crime where a person

was hurt" and "seen someone get shot, stabbed, or beaten up" (Stoddard, Heinze, Choe, & Zimmerman, 2015). Items included 5 response options ranging from 0 times to 4+ times. The Pearson correlation alpha for these two items was .72.

Exposure to violence—victimization.

Three items was asked to measure how much violence victimization each participant had suffered in the past twelve months. An example item asked in the past 12 months: "had someone physically assault or hurt you." Five response options were available, ranging from 0 times to 4+ times. Cronbach alpha for these three items was .54.

Demographics.

Individuals self-identified their sex and race. Socioeconomic status was determined by a yes/no question asking if the family they live with receives any type of income support (e.g., ADC, SSI, food stamps, social security).

Exposure to violence—perpetration.

Eight questions were used to measure participants' perpetration of violence toward others using a 5-point Likert-type response format (1 = 0 times, 5 = 4+ times) (Xue, Zimmerman, & Cunningham, 2009). The items asked the youth to assess the frequency of violent behaviors over the last 12 months, such as: "taken part in a fight where a group of your friends were against another group," "hurt someone badly enough to need bandages or a doctor," "gotten into a fight outside of school," and "gotten into a fight in school." The Cronbach alpha for these items was .80.

Analysis

Latent profile analysis was used to describe the exposure to violence profiles in wave 4 of the FAS sample. In this analysis, I standardized three measures, consisting of various forms of

violence exposure (i.e., victimization, family conflict, violence observation). To improve the optimal solution with the highest log likelihood value, I increased the number of starting value sets to 500 in the first step of the optimization (Geiser, 2012). The analysis was performed using Mplus (version 6.1) with statistical cutoffs, substantive criteria, and interpretability.

Indicators of the latent profile analysis were three continuous measures that reflect different forms of exposure to violence (i.e., victimization, family conflict, and witnessing violence). Latent profile analyses were conducted to specify 1 to 6 classes (Table 2). Solutions were evaluated using the following indices. I used the Bayesian information criterion as reference (BIC), which has been found to be a better indicator of the number of classes than likelihood ratio tests (Nylund, Asparouhov, & Muthén, 2007). Lower BICs reflect a better fitting model. Then, additional indicators were examined to assess model fit. The Akaike Information Criterion (AIC), entropy, Bootstrap LR Difference Test (BLRDT) with 500 samples, and Lo-Mendell-Rubin Adjusted Likelihood Ratio Tests (LMRT) were examined. Both the BLRDT and LMRT compare the solution with one fewer class and a significant test statistic indicates the one fewer class solution does not improve the fit (Geiser, 2012). For the AIC, similar to the BIC, lower values indicate a better fitting model (Nylund et al., 2007). Lastly, relative entropy assesses the classification certainty. Values near 1 indicate higher certainty in classification.

Following the latent profile analysis, the most likely class memberships were saved and Chi-square and ANOVA tests were performed to compare classes on demographic characteristics and levels of violence perpetration. Scheffé post hoc comparisons were performed for the ANOVA test. Participants missing from the current analysis were more likely to be males ($t(848) = 3.47$, $p \leq .001$) and were more likely to be the recipient of income support ($t(216) = 2.34$, $p = .026$), but did not differ by age or race.

Results

Research Goal 1: Extraction of latent profiles

The 3-group solution was the best fitting model, after taking into consideration the sample size adjusted BIC, entropy, LMRT, and theory. I explored each solution option using both theoretical and statistical perspectives. While some may argue that the 4-class solution is a better fit, in interpreting latent profile analysis findings, theoretical explanations must be considered and a 3-class solution with three clear different levels of exposure to violence was more pronounced than the 4-class solution. All solutions with 4 or more classes resulted in at least one group with 6 or fewer individuals. In the 4-class solution, 5 individuals comprised the fourth group, and all had high rates of all forms of exposure. In the 3-class solution, these 5 individuals were in the same group—the group with the highest rates of violence across all domains (group 3 below). Additionally, the five individuals in the fourth group had a greater amount of exposure to violence than those in the high ETV group, but the differences were minimal. For example, the group mean for these five individuals for family conflict was only slightly higher than the high ETV group in the 3-class solution (M = 1.93, SD = .73 and M = 1.80, SD = .69, respectively). Therefore, instead of dropping these five individuals, or creating a 4^{th} group, the differences between the high ETV group and this fourth group seem minimal and appropriate to proceed with a 3-class solution.

As presented in Table 3 and 4, the three profiles represent: (1) "Low exposure to violence (Low ETV)," individuals who have low rates of exposure to violence for all exposure to violence measures, n = 635 (82%); (2) "Mild exposure to violence with high exposure to family conflict (Med ETV)," individuals who have an exposure to violence profile that is slightly higher than the Low ETV group on all measures except family conflict, which is high, n = 93 (12%); and (3)

"High ETV," individuals who have high rates of exposure to violence across all three measures, n = 42 (5%).

Research Goal 2: Group comparisons

Demographic characteristics.

Males were more likely to be in the med ETV group, χ^2 (2, N = 728) = 9.77, $p \leq .01$ and the high ETV group, χ^2 (2, N = 677) = 5.87, $p \leq .05$ compared to the low ETV group. The groups did not differ by race or by family receiving aid (Table 3).

Violence Perpetration.

The exposure profile groups differed by violence perpetration, $F(2, 791) = 141.01$, $p \leq .001$. The High ETV group had the highest average perpetration score (M = 2.96, SD = .54), followed by the Med ETV group (M = 1.62, SD = .04). The low ETV group had the lowest average perpetration score (M = 1.12, SD = .21).

Discussion

This study contributes to the literature by measuring a large and unique sample of at-risk youth, as well as using several comprehensive measures of exposure to violence (i.e., witnessing violence, family conflict, victimization). By using latent class profiles to examine exposure to violence, some of the traditional shortcomings of the standard approach to investigating exposure to violence (e.g., lose concurrent exposure to violence information, cannot determine unique effects of specific domains of exposure, difficult to focus on a single domain of exposure) are mitigated. While few researchers have conducted latent class/profile analyses in the past, those studies were limited due to their exposure to violence measures and their sample sizes (Felix & McMahon, 2006; Lambert, Nylund-Gibson, Copeland-Linder, & Ialongo, 2010; Walsh, Senn, & Carey, 2012). Historically, when researchers examined exposures to violence, they treat all

exposures equally, without creating specific exposure to violence profiles. This is problematic as unique effects of different types of exposure to violence may not arise during investigation. For example, someone who witnesses two robberies in their neighborhood is given equal weight to someone who witnesses two people getting shot. By using traditional research investigation techniques, it is difficult to compare concurrent exposures to violence. By investigating exposure to violence using latent profiles, we learn that it is possible to have multiple concurrent exposures to violence. This analytical approach is novel for studying exposure to violence because it allows researchers to study exposure to violence in a particularly sensitive and nuanced manner. This is especially important because researchers have found that even low exposures to a risk factor can increase the odds for unintended repercussions (Quinlan et al., 2005; Breslau, Chilcoat, Kessler, & Davis, 1999; Moylan, 2010). Therefore, this nuanced approach to study exposure to violence may help practitioners decrease the odds for subsequent repercussions and interventions can be appropriately tailored to better protect the victims of those exposed to violence.

A notable finding from this study is that violence perpetration is different between each of the three exposure to violence profiles. For example, those in the high exposure to violence profile had the greatest level of violence perpetration, and those with a low exposure to violence profile had the lowest levels of violence perpetration. Exposure to violence can be a traumatic experience and can result in increased stress (Berton & Stabb, 1996). The results suggest that the more exposure to violence a youth experiences, the more likely they are to become normalized to the use of violence for conflict resolution and subsequent pro-violent beliefs can continue into adulthood (Arnett, 2000; Garbarino, Bradshaw, & Vorrasi, 2002).

This study is particularly salient given the age of participants. Violent perpetration tends to peak in late-adolescence and then decreases steadily over time (USDHHS, 2001). It is during this late-adolescence stage that their pre-frontal cortex (PFC), the part of the brain responsible for emotional expression and reward sensitivity, is still developing (Kelley, Schochet, & Landry, 2004). This part of the brain is highly malleable and may be influenced from exposure to violence (Sabbagh, 2006). Consequently, youth who are exposed to violence may also at an increased risk for several negative consequences, such as depressive and anxious symptoms, substance use, academic problems, homelessness, aggression and conduct problems, suicidal thoughts, physical injuries, and engagement with the criminal justice system (Krug et al., 2002; Menard, 2002; Vermeiren, Schwab-Stone, Deboutte, Leckman, & Ruchkin, 2003; Wordes & Nunez, 2002). In addition to the fear of physical trauma due to violence, the long-term effects of exposure to violence can be substantial. Berton & Stabb (1996) found that 29% of youth who were exposed to violence reported clinical levels of posttraumatic stress disorder (PTSD). It is pertinent for researchers to continue studying exposure to violence in new ways, in particular at this critical developmental stage, so practitioners can better protect vulnerable populations from negative long-term outcomes.

While this latent profile analysis offers a fresh perspective for studying exposure to violence, this method also has limitations. For example, classes may differ based on the sample and measures used. Moreover, some participants may fit in more than one group quite well, but the analysis forces them to be placed in only one group. Consequently, an individual may fall between two groups and these groups may not be so different from one another. Yet, this method is superior to cluster analysis, because latent profile analyses uses fit statistics to classify participants, and also provides probability statistics for each individual, which can be used in

later analyses to account for weighted group membership and misclassification. Additionally, the high entropy in the analysis (0.95) suggests that the data are at low risk for misclassification, which is also an improvement on cluster analysis. Another limitation to this study is the violence victimization measure had a low Cronbach alpha (.54), however, this measure only had three items. Using the Spearman-Brown prediction formula to double the number of items, the Cronbach alpha is estimated to increase to .70 (Wainer & Thissen, 2001). Another limitation is the cross-sectional nature of the latent profile analysis. Instead of looking at several waves of data for the analysis, I only looked at wave 4 data, where the students were in their fourth year of high school (M = 18 years). Although exploring patterns of exposure to violence in a sample that is overwhelmingly African American is important and allows for greater generalizability of the research findings to populations of high-risk youth, the findings of this study are likely only generalizable to similar youth in similar contexts.

Implications for Practice.

Nevertheless, the latent profile analysis approach to investigating exposure to violence using measures of exposure from different domains could have many implications for practice. The findings from this study could improve efforts to study the long-term outcomes for those most at risk for exposure to violence. While we did not find any differences for how likely someone was to be in any of the three groups based on supplemental governmental aid or race, we did find that males were more likely than females to have a medium or high exposure to violence profile. Our results provide information for tailoring interventions for the most high-risk youth and suggest that interventions that are administered early may help mitigate long-term consequences of violence exposure. For example, if a youth witnesses a violent act in the community, given what we now know about exposure to violence profiles, that youth is at an

increased risk of having been victimized across different domains of violence. By learning the possibility of different, co-occurring exposures to violence, health care providers could be less likely to miss identifying exposures to violence, which will increase the chance that the victim receives adequate treatment.

The results of this study may help inform a useful clinical assessment tool for early detection and referral for prevention because they indicate differential risk based on violence exposure during late-adolescence. My results indicating that certain patterns of exposure to violence exist among youth can help health care practitioners focus on brief questions to determine who might be at highest risk for later health issues. Furthermore, if future research indicates distinct symptomology for certain patterns of exposure to violence profiles, practitioners will be better prepared to properly treat or refer individuals. Additionally, future research that investigates if exposure to violence profiles change from one developmental stage to another could further help identify high risk individuals and focus clinical resources on them.

In addition to the distinct latent class profiles we ascertained in our analyses, we investigated various differences between the three latent class profiles. For example, by determining that males are more likely than females to have a high exposure to violence profiles, we have additional support for focusing interventions on males; specifically, males are more likely to have high levels of concurrent exposures to violence. By learning the presence of different risk factors for different exposure profiles, tools can be developed to better identify youth at risk for different forms of exposure, and practitioners could be better prepared to intervene before it is too late. These findings further support that all exposures to violence should not be treated the same way, from both a research and practice perspective.

Table 3.1. Descriptive statistics for study variables of interest (*N* = 770)

	n (%)/Mean (SD)
Males	371 (48%)
Received aid	174 (23%)
Self-identify as Black	640 (83%)
Graduated high school by wave 5	546 (76%)
Victimization	1.30 (.53)
Witnessing violence	1.74 (1.04)
Family conflict	1.58 (.60)
Violence perpetration	1.28 (.51)

Table 3.2. Fit indices for latent profile analysis models with 1-6 classes for 12th grade

Model	AIC	BIC	BLRDT	LMRT	Entropy
1-class	17424.7	17461.9			
2-class	16955.1	16659.5	-8704.4, p<.001	p = .03	0.97
3-class	16290.3	16373.9	-8286.6, p<.001	p = .05	0.94
4-class*	16056.3	16136.2	-8127.1, p<.001	p = .04	0.95
5-class*	15857.9	15988	-8005.4, p<.001	p = .37	0.95
6-class*	15718.3	15871.6	-7900.0, p<.001	p = .27	0.96

*at least one cluster contained less than 1% of sample

Table 3.3. Latent profile analysis group comparisons (*N* = 770)

Group comparison variables	Total	1. Low ETV	2. Med ETV	3. High ETV	Pearson Chi-Square	Post hoc comparison
N	770	635 (82%)	93 (12%)	42 (5%)		
Males		286 (45%)	58 (62%)	27 (64%)	9.77	1<2**
					5.87	1<3*
					0.046	2>3
Receive aid		136 (22%)	26 (29%)	12 (32%)	2.01	1<2
					0.93	1>3
					1.81	2>3
Self-identify as Black		525 (83%)	93 (69%)	38 (91%)	1.71	1<2
					1.35	1>3
					0.001	2>3
		Low ETV	**Med ETV**	**High ETV**	**Group difference (F)**	**Scheffé Post hoc comparison**
Perpetration scale		1.12 (.21)	1.62 (.04)	2.96 (.54)	1029.4***	1>2***
						1<3***
						2>3***

Note: ETV = exposure to violence, FC = family conflict
* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

Table 3.4. Mean (sd) for 3 LPA profiles among 12th graders (*N* = 770)

	Low ETV	Med ETV	High ETV
Victimization	1.22 (.43)	1.54 (.67)	2.07 (.79)
Observed Violence	1.35 (.50)	3.46 (.83)	3.86 (1.10)
Family Conflict	1.52 (.56)	1.80 (.70)	1.94 (.72)

References:

Aisenberg, E., Gavin, A., Mehrotra, G., & Bowman, J. (2011). Defining Violence. In T. I. Herrenkohl, E. Aisenberg, J. H. Williams, & J. M. Jenson (Eds.), *Violence in context: Current evidence on risk, protection, and prevention* (pp. 13–26). New York, New York: Oxford University Press.

Andersen, M., & Collins, P. H. (2015). Race, class, & gender: An anthology. Cengage Learning.

Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist*, *55*(5), 469.

Bandura, A. (1973). Aggression: A social learning analysis.

Berton, M. W., & Stabb, S. D. (1996). Exposure to violence and post-traumatic stress disorder in urban adolescents. *Adolescence*, *31*(122), 489.

Boyd, C. P., Gullone, E., Needleman, G. L., & Burt, T. (1997). The Family Environment Scale: Reliability and normative data for an adolescent sample. *Family Process*, *36*(4), 369–373.

Breslau, N., Chilcoat, H. D., Kessler, R. C., & Davis, G. C. (1999). Previous exposure to trauma and PTSD effects of subsequent trauma: results from the Detroit Area Survey of Trauma. *American journal of Psychiatry*, *156*(6), 902-907.

Butchart, A., Mikton, C., Dahlberg, L. L., & Krug, E. G. (2015). Global status report on violence prevention 2014. *Injury Prevention*, *21*(3), 213–213.

Centers for Disease Control and Prevention. (2015). Web-based Injury Statistics Query and Reporting System (WISQARS). *National Center for Injury Prevention and Control, Centers for Disease Control and Prevention*. Retrieved from http://www.cdc.gov/injury/wisqars/index.html

Crime in the United States. (2013). *Crime in the United States*.

Dahlberg, L. L. (1998). Youth violence in the United States: Major trends, risk factors, and prevention approaches. *American Journal of Preventive Medicine*, *14*(4), 259–272.

Dempsey, M., Stacy, O., & Moely, B. (2000). "Approach" and 'avoidance' coping and PTSD symptoms in innercity youth. *Current Psychology*, *19*(1), 28–45.

Felix, E. D., & McMahon, S. D. (2006). Gender and multiple forms of peer victimization: How do they influence adolescent psychosocial adjustment? *Violence and Victims*, *21*(6), 707–724.

Garbarino, J., Bradshaw, C. P., & Vorrasi, J. A. (2002). mitigating the effects of gun violence on children and youth. *The Future of Children*, *12*(2), 72–85. Retrieved from http://www.jstor.org/stable/1602739

Gee, G. C., & Ford, C. L. (2011). Structural racism and health inequities. *Du Bois Review: Social Science Research on Race*, *8*(01), 115–132.

Geiser, C. (2012). Data analysis with Mplus.

Hastings, T. L., & Kelley, M. L. (1997). Development and validation of the Screen for Adolescent Violence Exposure (SAVE). *Journal of Abnormal Child Psychology*, *25*(6), 511–520.

Huesmann, L. R. (1988). An information processing model for the development of aggression. *Aggressive Behavior*, *14*(1), 13–24.

Kelley, A. E., Schochet, T., & Landry, C. F. (2004). Risk taking and novelty seeking in adolescence: introduction to part I. *Annals of the New York Academy of Sciences*, *1021*(1), 27–32.

Krug, E. G., Mercy, J. A., Dahlberg, L. L., & Zwi, A. B. (2002). The world report on violence

and health. *The Lancet*, *360*. Retrieved from http://www.sciencedirect.com/science/article/pii/S0140673602111330

Lambert, S. F., Nylund-Gibson, K., Copeland-Linder, N., & Ialongo, N. S. (2010). Patterns of community violence exposure during adolescence. *American Journal of Community Psychology*, *46*(3-4), 289–302.

Menard, S. W. (2002). Short and long-term consequences of adolescent victimization.

Moos, R. H., & Moos, B. S. (1994). Family environment scale manual.

Moylan, C. A., Herrenkohl, T. I., Sousa, C., Tajima, E. A., Herrenkohl, R. C., & Russo, M. J. (2010). The effects of child abuse and exposure to domestic violence on adolescent internalizing and externalizing behavior problems. *Journal of family Violence*, *25*(1), 53-63.

Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling*, *14*(4), 535–569.

Perkins, C. A. (1997). Age patterns of victims of serious violent crime.

Quinlan, K. P., Brewer, R. D., Siegel, P., Sleet, D. A., Mokdad, A. H., Shults, R. A., & Flowers, N. (2005). Alcohol-impaired driving among US adults, 1993–2002. *American journal of preventive medicine*, *28*(4), 346-350.

Sabbagh, L. (2006). The teen brain, hard at work. *Scientific American Mind*, *17*(4), 20–25.

Sanchez, Y. M., Lambert, S. F., & Cooley-Strickland, M. (2013). Adverse life events, coping and internalizing and externalizing behaviors in urban African American youth. *Journal of Child and Family Studies*, *22*(1), 38–47.

Schubiner, H., Scott, R., & Tzelepis, A. (1993). Exposure to violence among inner-city youth. *Journal of Adolescent Health*, *14*(3), 214–219.

Stoddard, S. A., Heinze, J. E., Choe, D. E., & Zimmerman, M. A. (2015). Predicting violent behavior: the role of violence exposure and future educational aspirations during adolescence. *Journal of Adolescence*, *44*, 191–203.

Terr, L. C. (2003). Childhood traumas: An outline and overview, *1*(3), 322–334.

USDHHS. (2001). Youth Violence: A Report of the Surgeon General.

Vermeiren, R., Schwab-Stone, M., Deboutte, D., Leckman, P. E., & Ruchkin, V. (2003). Violence exposure and substance use in adolescents: findings from three countries. *Pediatrics*, *111*(3), 535–540.

Wainer, H., & Thissen, D. (2001). True score theory: The traditional method (pp. 23–72). Lawrence Erlbaum.

Walsh, J. L., Senn, T. E., & Carey, M. P. (2012). Exposure to different types of violence and subsequent sexual risk behavior among female sexually transmitted disease clinic patients: A latent class analysis. *Psychology of Violence*, *2*(4), 339.

Wordes, M., & Nunez, M. (2002). Our vulnerable teenagers: Their victimization, its consequences, and directions for prevention and intervention. *Oakland, CA: National Council on Crime and Delinquency*.

Wright, R. J. (1998). Exposure to violence. *The British Journal of Psychiatry*, *184*, 169–175.

Xue, Y., Zimmerman, M. A., & Cunningham, R. (2009). Relationship between alcohol use and violent behavior among urban African American youths from adolescence to emerging adulthood: A longitudinal study. *American Journal of Public Health*, *99*(11), 2041–2048.

Chapter 4: Applying a Latent Profile Analysis Approach to Investigating the Relationships of Exposure to Violence and Violence Perpetration, Substance Use, and Depressive Symptoms Across Developmental Stages

Background: The objective of this study is to determine if latent profiles of exposure to violence during late-adolescence (i.e., low, medium, high exposure to violence) are associated with violence perpetration, substance use, and depression in early-adulthood. These outcomes of interest have never been examined across developmental stages using a latent profile analysis to exposure to violence. This technique allows us to study if difference domains of exposure to violence (i.e., family conflict, witnessing violence, victimization), occurring concurrently, have differential symptomology across developmental stages. I hypothesize that given the severity of the trauma one experiences when exposed to violence, those with a medium or high exposure to violence profile will have higher rates of substance use and depression. Additionally, given the frequency of the use of violence to solve problems in this sample, I hypothesize that those with higher rates of exposure to violence will be more likely to be a violent perpetrator later in life.

Methods: Participants included 620 individuals from a predominantly poor, urban community. Exposure to violence profiles evolved from a latent profile analysis when participants were in their fourth year of high school (M = 17.9 years). Growth models were conducted to determine if latent profiles of exposure to violence were associated with violent perpetration, substance use, and depression during early-adulthood (ages 29.3-32 years). All covariates and dependent variables were imputed using expectation-maximization imputation techniques, and all of these variables were time-varying.

Results: Participants with a high exposure to violence latent profile were at greater risk for violence perpetration during early-adulthood, compared to those with a low exposure to violence profile. Additionally, those with a high exposure to violence profile were more likely to have increasing violence perpetration levels in early-adulthood, compared to those with a low exposure to violence profile.

Contributions: By identify a group of youth who are at high risk of violence perpetration later in life, we have a better understanding of how violence may manifest in those exposed by violence. With an understanding that the segment of the population is more likely to have more and increasing violence perpetration later in life, interventions could be designed, tailored, and administered once practitioners learn of the violence exposure, to mitigate long-term consequences. Therefore, young persons' risk for long-term health consequences, for reasons completely outside of their own capacity, could be mitigated.

Introduction

Exposure to violence is associated with several negative outcomes. Youth exposed to violence are more likely to have economic disadvantage, criminal victimization, and criminal perpetration (Covey, Menard, & Franzese, 2013; Menard, 2012). In one study, 29% of youth from a Southern metropolitan community who were exposed to violence reported clinical levels of posttraumatic stress disorder (PTSD) (Berton & Stabb, 1996). Furthermore, in a meta-analysis of 41 studies examining the effects of exposure to violence, researchers found that those exposed to violence were at an increased risk for both internalizing and externalizing behaviors (Wolfe, Crooks, Lee, McIntyre-Smith, & Jaffe, 2003). Although we know of some of the repercussions of exposure to violence, much remains to be learned. By taking one aspect of violence and an analytical approach that has not been widely applied to this research problem, we have the opportunity to gain a better understanding of this well-known problem.

Although we know that one's risk for negative outcomes are associated with being exposed to violence, few researchers have investigated exposure to violence using a robust measures in a longitudinal manner. Measures of exposure to violence tend to be narrow in scope and focus on only one specific domain (e.g., witnessing, victimization, or family conflict) (Aisenberg, Gavin, Mehrotra, & Bowman, 2011; Terr, 2003). In the past, when researchers examined multiple exposures to violence, most only sum binary items to produce an overall exposure to violence score, thereby losing important information on the differential effect of different forms of violence exposure (Wright, 1998). To investigate exposure to violence while accounting for multiple forms of exposure and filling the literature gaps noted above, I will conduct a latent profile analysis of three domains of violence (i.e., family conflict, witnessing violence, victimization). I will use these latent profiles to study if different patterns of distinctive

types of violence exposure early in life contribute to consequences later in life (i.e., violence perpetration, substance use, and depression). Each of these three consequences need immediate attention and for innovative research techniques to be applied to these serious public health problems. Substance use and depression, if left untreated, can be debilitating. Violence perpetration in early-adulthood increases one's risk for involvement in the criminal justice system, and an increased likelihood for having an unstable family structure (Menard, 2012). By investigating an association between exposure to violence and these three pertinent public health problems, I provide a new perspective by using a latent profile analysis approach, across several developmental stages.

Violence perpetration

Researchers often state that exposure to violence is a risk factor for later violent perpetration and victimization, but this assertion has not been tested adequately. The 2001 Surgeon General's Report states: "Studies have shown that adolescents exposed to violence are more likely to engage in violent acts," and then goes on to cite several studies, none of which actually tested this relationship (pg. 1902). Cited in the report, Fagan & Wilkinson (1998) discuss how exposure to violence should, theoretically, lead to violence given a script framework, but they did not actually conduct such a study (Fagan & Wilkinson, 1998). Another cited study in the report linked exposure to violence to symptoms of psychological trauma, but not to violent behaviors (Singer, Anglin, Song, & Lunghofer, 1995). Other researchers that are frequently cited when linking exposure to violence with subsequent violent behaviors have yielded inconsistent results (Finkelhor et al., 2005) with several researchers reporting no significant relationships (Feigelman, Howard, Li, & Cross, 2000). These inconsistencies may results from studies of varying timeframes and measurement. To best understand the association

between exposure to violence and violence perpetration, a cross-developmental study is needed that accounts for concurrent exposures to violence.

While prior researchers have found inconsistencies when studying the association between violence exposure and violent behaviors, such an association can be explained by social cognitive theory and scripts theory. According to Bandura's social cognitive theory, behaviors and attitudes are learned through observation (Bandura, 1973). In conjunction with social cognitive theory, script theory posits that youth learn scripts through observation, which are then activated when environmental cues arise (Huesmann, 1988). Taken together, these two theories provide support for the notion that exposure to violence may engender the use of violence. I hypothesize that those with high or medium exposure to violence profiles in late-adolescence are more likely to use violence to solve problems later in life.

Substance use

Although tobacco and alcohol use among American youth is at an all time low, roughly half of all 8^{th}-12^{th} graders in the United States have used at least one illicit substance in their lifetime (Miech, Johnston, O'Malley, Bachman, & Schulenberg, 2015). In fact, in 2013, 24.6 million Americans over the age of 11 (up 8.3% since 2002) had used an illicit drug in the past month (Substance Abuse and Mental Health Services Administration, 2015). While isolated instances of illicit substance use are common in the general population, and even though such substance use is unlikely to lead to life-long problems, certain segments of the population (i.e., those living below at or below poverty) are more likely to develop substance use problem behaviors (e.g., substance use disorders, and polysubstance use disorders) (Diez Roux et al., 1997; Galea, Ahern, Tracy, & Vlahov, 2007; Goldmann & Galea, 2014). Explanations for why

low-income individuals are at greater risk for negative substance use behaviors, however, are understudied.

Research suggests that experiencing stressful events, and the psychological or emotional stress that follows, is strongly associated with substance use (Shiffman, 1993). According to the stress-coping model of substance use, the use of substances is a negative coping response to stress, and substances are used to either heighten positive affect or lower negative affect (Wills & Shiffman, 1985). Moreover, the self-medication hypothesis suggests that heavy substance users engage in consumption as a defense mechanism to protect one's ego and/or to dull pain (Khantzian, 1997). When individuals experience psychological pain, their use of substances could sustain into the future as a self-medicated coping response. Exposure to violence can be a traumatic experience that causes long-term psychological pain (Berton & Stabb, 1996). Therefore, I hypothesize that those with high exposure to violence profiles are at an increased risk for greater substance use later in life.

Depression:

To a young person, being exposed to violence can be interpreted to mean that their community and world are unsafe, and that they are unworthy of being protected (Lynch & Cicchetti, 1998). Among the host of negative repercussions associated with exposure to violence, internalizing symptoms are often cited (Kliewer, Lepore, Oskin, & Johnson, 1998; Ozer & Weinstein, 2004). Internalizing problems refer to somatic complaints, problems of withdrawal, and anxiety or depression (Achenbach, 1991). Youth exposed to violence are less likely to talk with others about stress-related concerns and thoughts, thereby increasing their risk for anxiety and depression (Kliewer et al., 1998; Ozer & Weinstein, 2004). If left untreated, depression can increase one's risk of suicide, addiction, self-injury, reckless behavior, relationship problems,

and health concerns (Angst et al., 2002). Yet, when researchers have specifically investigated the relationship between exposure to violence and depression, they have yielded inconsistent findings (Margolin & Gordis, 2000). For example, Gorman-Smith & Tolan (1998) found that among 245 Latino and African American boys from a disadvantaged community in Chicago, exposure to violence increased depression over a one year period (Gorman-Smith, Henry, & Tolan, 2004). In a different cross-sectional sample of 185 high school students from poor inner-city school, youth exposed to chronic community violence were more likely to display internalizing behaviors (i.e., somatic complains, withdrawn behavior), but not depressive symptoms (Cooley-Quille, Boyd, Frantz, & Walsh, 2001). Finally, in a cross-sectional study of 251 youth from an economically-disadvantaged community, researchers found that the relationship between exposure to violence and depression was curvilinear (Gaylord-Harden, Cunningham, & Zelencik, 2011).

To determine if depression resulting from exposure to violence is simply a short-term byproduct, or a serious long-term consequence, we need to study this relationship across many years. Given the trauma associated with being exposed to violence, and the development vulnerability of those in emerging adulthood, I hypothesize that those with either a medium or high exposure to violence profile will have elevated rates of depression in early-adulthood.

In this study, to address the weaknesses in the literature, I will investigate the associations between exposure to violence and a host of outcomes across developmental stages. According to the socioecological model, someone's social and physical environment provides a framework of influence for how social determinants affect behavior (Bronfenbrenner & Morris, 2006; Sallis, Owen, & Fisher, 2008). Thus, if a young person lives in an environment with high rates of exposure to violence, the effects of the violence exposure may affect that individual across later

developmental stages (Bronfenbrenner, 1986). The developmental stages studied here are late-adolescence (average age 17.9 years), emerging adulthood (ages 20-23 years), and early-adulthood (ages 29-32 years). During late-adolescence, considerable growth in the prefrontal cortex occurs, which is the areas of the brain responsible for decision making (Sabbagh, 2006). Salient events in a young person's life may help shape this highly malleable part of the brain. In addition, I study late-adolescence and emerging adulthood, as opposed to earlier stages of development, because behaviors initiated during late-adolescence and emerging adulthood are more likely to continue into adulthood, as opposed to a young person engaging in a particular behavior during early-adolescence for experimental purposes (Menard, Covey, & Franzese, 2015; Thornberry, Ireland, & Smith, 2001).

Methods

The data for this study were collected as part of the Flint Adolescent Study (FAS), a longitudinal study that began as an analysis of youth at risk for school dropout. Beginning in 1994, this longitudinal study enrolled of 850 ninth graders from Flint, Michigan, and data collection continued for 12 (non-consecutive) waves (ages 14-33 years).

In the initial sample, participants self-reported their race/ethnicity and included 679 African-American ninth graders (80%), 145 Whites (17%), and 26 mixed African-American and white (3%), which was an accurate depiction of the Flint population in 1994. Both sexes were equally represented in the sample and they were of similar age (Males: $M = 14.93$, $SD = 0.66$; Females: $M = 14.79$, $SD = 0.62$).

In this study, I use findings from a previous study (study two of this dissertation), which resulted in three distinct latent profiles. These latent profiles were created from FAS wave 4 data, when the participants averaged 17.9 years old. Out of the 12 waves of data, I chose wave 4 for

the latent profile analysis due to this age group having the greatest risk of being a victim of violence, and at an age where their prefrontal cortex was still developing and easily malleable—the part of the brain responsible for risk taking and decision making. Indicators of the latent profile analysis were three continuous measures that reflect different forms of exposure to violence (i.e., victimization, family conflict, and witnessing violence). As a result of the latent profile analysis, I decided on a three-class solution (See measures section).

For the current study, I fit a series of multilevel growth models for three separate outcomes (i.e., violence perpetration, substance use, and depression; waves 8-12). Each model includes fixed and random effects for each outcome variable during early-adulthood. In addition to a series of time-varying covariates (emerging adulthood: waves 5-8), the models also include the previously mentioned latent profiles from late-adolescence as categorical variables (wave 4), with the low ETV group serving as the reference group. Random effects are included in the model to account for the clustering effects of time and individuals in the error terms. These analyses allow us to examine if unique exposure to violence profiles are associated with several health outcomes later in life, and to determine if different exposure to violence profiles are associated with unique symptomology. In addition to the multilevel growth models predicting main effects, I also included interaction effects to determine if the latent profiles' slopes differed. These analyses were conducted using STATA (version 13.1). Missing values were be imputed with maximum-likelihood (M-L) algorithm imputation techniques and 16.4% of cases were imputed.

Measures

Means and standard deviations from all study variables of interest are presented in Table 1.

Covariates.

Demographics

Individuals self-identified their race and sex. Family socioeconomic status at wave 4 was determined from a parental occupational prestige rating (Nakao & Treas, 1992). Participants reported the occupations of their guardian(s), which was then assigned a score. The higher the score, the higher the level of socioeconomic status (SES). If youth reported occupations for both parents, I included only the highest. If both parents were unemployed, they received a zero for SES. This covariate was included because researchers have found a relationship between poverty during adolescence and substance use and mental health disorders (Vermeiren et al., 2003).

High school graduate/equivalent

Data from wave 5, 6, 7, and 8 (1999-2002) were used to determine if participants had graduated from high school, or received an equivalent degree. The participants were asked what is the highest level of schooling they completed, and if they responded with any of the following responses during any of the four waves of data, they were considered to have graduated high school: High school diploma, GED, or 1, 2, or 3 year(s) of college/trade school. This item is included as a covariate given its relationship with several negative outcomes later in life (e.g., psychological well-being, antisocial behavior, incarceration, and substance use) (Fletcher, 2008; Townsend, Flisher, & King, 2007).

Independent variables.

Violence perpetration

Five items measured each participant's amount of perpetration of violence toward others (Xue, Zimmerman, & Cunningham, 2009). Items asked the participant to indicate the frequency of each of the five behaviors over the last 12 months. Examples include: "taken part in a fight where a group of your friends were against another group," "hurt someone badly enough to need

bandages or a doctor," and "gotten into a fight outside of school." Each item used a 5-point frequency response format (1 = 0 times, 5 = 4+ times), and the five items were averaged, with a higher score indicating more perpetration. Violence perpetration during emerging adulthood was included in the analysis as a time-varying variable (waves 5-8). Cronbach alphas for the four waves ranged from .68 to .72.

Substance use

Cigarette, alcohol, and marijuana use in the past 30 days were independently assessed using three separate questions. Each item asked how often participants used that specific substance in the past 30 days. Response options range from "not at all" to "two packs or more per day" for the cigarette question and up to "40+ times" for alcohol and marijuana use. Scores for each item range from 1 to 7. The higher the score, the more often they used that substance in the past 30 days. These questions are the same used in the Monitoring the Future Study (Johnson, Adams, Hall, & Ashburn, 2010). Cigarette, alcohol, and marijuana use during emerging adulthood was included separately as time-varying covariates.

Depressive symptoms

Depressive symptoms were measured using the Brief Symptom Index, which is an average of six items that assessed symptoms during the past week, including thoughts of ending your life, feeling lonely, and feeling blue (Derogatis & Spencer, 1993). Scores ranged from 1-5, with a score of 5 reflecting greater depressive symptoms, and a score closer to 1 reflected little to no depressive symptoms. Depressive symptoms during emerging adulthood were included as a time-varying covariate (waves 5-8). Cronbach alphas for the four waves ranged from .83 to .87.

Exposure to violence profiles

The three exposure to violence latent profile profiles from wave four assessed three domains of exposure to violence: victimization, family conflict, and observing violence. To measure victimization, three items asked the respondent how much violence victimization the participant suffered in the past twelve months. An example item asked how often in the past 12 months: "had someone physically assault or hurt you." Five response options were available, ranging from 0 times to 4+ times, and I used an average over the three items, with a higher score indicating more victimization. To measure family conflict, five questions asked the participants to assess their family as a whole for some of the following items: "we fight in our family," "family members get so angry they throw things," and "family members lose their tempers." Five response options were available, (0 times to 4+ times), and I averaged the five items, with a higher score indicating more family conflict. Lastly, participants reported the frequency of witnessing violent acts over the past 12 months through two questions: Had they "seen someone commit a violent crime where a person was hurt" and "seen someone get shot, stabbed, or beaten up." Items included 5 response options ranging from 0 times to 4+ times. I averaged the two items, with a higher score indicating a great frequency of witnessing violence.

The three exposure to violence profiles include: (1) "Low exposure to violence (Low ETV)," individuals who have low rates of exposure to violence for all exposure to violence measures, n = 635 (82%); (2) "Mild exposure to violence with high exposure to family conflict (Med ETV)," individuals who have an exposure to violence profile that is slightly higher than the Low ETV group on all measures except family conflict, which is high, n = 93 (12%); and (3) "High ETV," individuals who have high rates of exposure to violence across all three measures, n = 42 (5%).

Dependent variables.

Violence perpetration

Violence perpetration, as a dependent variable, used the same scale previously described. Items asked the participant to indicate the frequency of each of the five behaviors over the last 12 months. As an outcome variable, violence perpetration was included as a time-varying variable (waves 9-12). Cronbach alphas for the four waves ranged from .49 to .86.

Substance use

The same three questions mentioned above to assess cigarette, alcohol, and marijuana use in the past 30 days were used as an outcome variable. As a dependent variable, I created an index of the sum of all three of these variables at each wave from 9-12, as a time-varying variable. This item has a range of 0-21, with the higher score pertaining to more substance use.

Depressive symptoms

As a dependent variable, depressive symptoms were measured with the same six items discussed above. Again, scores ranged from 1-5, with a higher score reflecting greater depressive symptoms. Here, the depressive symptoms variable is time-varying (waves 9-12). Cronbach alphas for the four waves ranged from .86 to .90.

Results

Growth model estimates of all fixed effects, estimated variances of the random effects, and fit indices for violence perpetration, substance use, and depression are reported in Table 2, 3, and 4, respectively. In each of the three series of analyses, time was tested as both linear and quadratic functions.

Violence perpetration.

In the first regression model I performed, time (quadratic) was not associated with substance use, b = -.01, z(617) = -1.44, p = .15, nor was time (linear), b = .02, z(617) = 1.87, p =

.06. Given my theoretical framework that exposure to violence may be associated with violence perpetration, I decided to conduct additional analyses. When the covariates were included in the model (model 2), violence perpetration in emerging adulthood (b = .05, z(608) = 3.16, $p \leq .001$) and males (b = .08, z(608) = 4.07, $p \leq .001$) were predictive of violence perpetration in early-adulthood. Additionally, those who had graduated high school, or the equivalent, before their 24th birthday, were less likely to engage in violence perpetration during early-adulthood (b = -.07, z(608) = -3.02, p = .002). In the next model (model 3), I added the categorical variable of the latent profiles exposure to violence from wave 4, with the low exposure to violence group as the reference. In this model, the high exposure to violence group was significantly higher than the low exposure to violence group (b = .15, z(607) = 3.89, $p \leq .001$), while the medium exposure to violence group was not statistically different from the reference group (b = .04, z(607) = 1.29, p = .20).

To determine if a difference in slopes was present for the latent profiles, I ran two additional models, one with time as a linear function (model 4), and one with time as a quadratic function (model 5). When both the linear and quadratic time functions are included in the model, (model 5), the medium exposure to violence group interaction term with time as a linear function was significantly higher than the reference group (low exposure to violence group), b = .09, z(605) = 1.97, p = .05. None of the quadratic interaction terms were significant.

Substance use.

I ran a series of models to determine if the latent profile analysis from wave 4 were associated with substance use during early-adulthood. In the first regression model I performed, both the quadratic (b = -.24, z(669) = -4.70, $p \leq .001$), and linear terms(b = -.75, z(669) = 4.70, $p \leq .001$) were associated with substance use. When I included covariates in the model (model 2),

marijuana use in emerging adulthood (b = .24, z(608) = 4.71, $p \leq .001$ was associated with substance use in early-adulthood. Additionally, those who identified as Black were more likely than others to have lower substance use in early-adulthood (b = -.89, z(608) = -2.89, p = .004). In the next model (model 3), I added the categorical variable of the latent profiles of exposure to violence from wave 4, with the low exposure to violence group as the reference. In this model, I found no differences in the substance use scores in early-adulthood between the three groups.

I ran two addition models to determine if differences in slopes were present for the latent profiles with time as either a linear or quadratic function (models 4 and 5, respectively). The high exposure to violence group approached the .05 significance level for both the linear (p = .06) and quadratic interaction term (p = .08).

Depression.

In the final regression model I performed, the quadratic term was not associated with depressive symptoms (b = -.01, z(617) = -1.79, p = .07) and the linear term was not significant (b = .02, z(617) = .96, p = .34). Despite these non-significant findings, I decided to move forward with the analysis given to our theoretical assumptions. When I added covariates to the model (model 2), cigarette use in emerging adulthood (b = .01, z(608) = 3.64, $p \leq .001$) and depression in emerging adulthood (b = .09, z(608) = 5.40, $p \leq .001$) were associated with depression in early-adulthood. Additionally, males had a lower depression score in early-adulthood (b = -.08, z(608) = -2.74, p = .006), compared to those who identified as a female. In the next model (model 3), I added the categorical variable of the latent profiles of exposure to violence from wave 4, with the low exposure to violence group as the reference. In this model, neither the medium exposure to violence group nor the high exposure to violence group were significantly different than the reference group of low exposure to violence (See Table 4).

To determine if the exposure to violence latent profiles differed in slopes, I ran two final models to include an interaction term of the latent profiles during emerging adulthood and time^2 (model 4) and an interaction term with time as a linear function. I found no difference in slope between the reference group (i.e., low exposure to violence) and either the medium exposure to violence group or high exposure group (see Table 4).

Discussion

The findings related to violence perpetration support tenets of social cognitive theory and script theory. I found that those with a high exposure to violence latent profile are at significant risk for long-term health outcomes. To our knowledge, this is the first time researchers have explored these relationships using a latent profile analysis and in a longitudinal manner over such a length of time. While many researchers have stated that exposure to violence is associated with violence perpetration, this is the first study, to our knowledge, that supports this claim across developmental stages. These findings support the claim that the scripts learned during late-adolescence are strong and salient enough that the effects of violence exposure during adolescence extend into early-adulthood. In addition, violent behavior may actually increase in e more for those exposed to moderate levels of violence compared to those with low exposure. These findings suggest that preventative interventions need to be developed to mitigate the risk for learning violent scripts.

While the findings related to substance use did not reach statistical significance, the findings suggest support for the stress-coping model and self-medication hypothesis. It appeared that the more exposure one had to violence during emerging adulthood, the steeper their substance use increased during their early-adulthood years. This finding only approached

significance, so these findings should guide further research on this subject, and not be used in isolation to support the stress-coping model and self-medication hypothesis.

We did not find an association between the exposure to violence latent profiles during late-adolescence and depression in early-adulthood. One interpretation of this finding suggested by other researchers is a desensitization model (Boxer et al., 2008; Ng-Mak, Salzinger, Feldman, & Stueve, 2004). Here, community members become normalized to community violence and are desensitized to the psychological distress that I hypothesized would result from exposure to violence. In this study, I attempted to account for the desensitization hypothesis by analyzing the data with an interaction of time as a quadratic variable. Yet, a longer timeframe may be needed to see such effects. Another explanation is that of survival. For American Americans living in high-crime, economically-disadvantaged, inner-city communities, expressing low self-esteem or sadness is associated with a greater likelihood of being victimized (Anderson, 2000; Reynolds, O'Koon, Papademetriou, Szczygiel, & Grant, 2001). Therefore, individuals from these communities may be more inclined to not express depressive symptoms.

My approach of using groups created from a latent profile analysis to investigate the long-term effects of exposure to violence is novel. This approach allowed me to account for different levels of various concurrent exposures to violence (i.e., family conflict, witnessing violence, and victimization). Interesting, I found that someone with a medium exposure to violence profile is not negatively affected any more than someone with a low exposure to violence profile for our three outcomes of interest. In the future, researchers may benefit by using this research approach in a larger sample of the population, with a larger set of exposure to violence indicators. This will allow researchers to investigate at which threshold of exposure to

violence do negative repercussions occur. Such findings could have implications for interventions, such serving as a marker of when treatment is needed.

Several limitations in this study must be noted. First, when the sample was originally recruited, we only included urban youth who entered 9th grade with low academic achievement. Poor academic achievement is a risk factor for violent perpetration, substance use, and depression (Bryant, Schulenberg, Bachman, O'Malley, & Johnston, 2000; Fletcher, 2008; Krug, Mercy, Dahlberg, & Zwi, 2002). Yet, by the time students in the sample were in their senior year of high school, academic performance was more normally distributed, and when high school graduation was include in the analyses, no significant findings were found for substance use and depression (Zimmerman, Caldwell, & Bernat, 2002). Second, respondents self-reported their exposures to violence, substance use behaviors, and depression symptoms. It is possible that these responses were influenced by social desirability bias or response recall, however, we attempted to ensure total privacy for the participants and informed them that their responses would be kept confidential. Additionally, substance use and violence questions were captured through the self-administered portion of the interview, not through the face-to-face portion, further mitigating potential bias. Third, the method of using a latent profile analysis is limited. For example, the groups may differ depending on the sample and measures used, thereby limiting the study's findings on other samples of the population. Some participants may fit convincingly into more than one group, but are forced into only one group. Consequently, someone may straddle two groups and these groups may not be so different. The latent profile analysis also does not provide a name for each group; the researcher must interpret each group, which is subjective. Another limitation to the latent profile analysis was its cross-sectional nature. Instead of looking at several waves of data for this part of the analysis, I only looked at

wave 4 data, where the students were in their fourth year of high school. I decided to only use this wave given the high frequency of exposure to violence at this stage of development. It is at this developmental stage that the decision-making part of the brain is still highly malleable and easily influenced by outside events. This approach serves as a touchstone for future latent profile analyses. In the future, researchers should explore if latent profiles of exposure to violence change across developmental stages, or are stable across time.

Implications for Practice.

These findings support the idea that exposure to violence is a traumatic experience that can have lasting effects, across stages of development. By identifying a group of youth who are at high risk of violence perpetration, we have a better understanding of how violence may manifest in those exposed by violence. With an understanding that a segment of the population with high rates of exposure to violence during emerging adulthood is more likely to have more and increasing violence perpetration later in life, interventions could be designed, tailored, and administered once practitioners learn of the violence exposure, to mitigate long-term consequences. For example, the findings from the latent class analysis could be implemented into an assessment tool. This assessment tool could be used in emergency departments, schools, and physician offices to assess the severity of the youth's exposure to violence. The tool could identify additional forms of violence exposure the youth should be asked out if they are positive for other forms of exposure. Furthermore, the tool could help enroll youth in appropriate treatment programs, as in a violence perpetration reduction intervention, such as the Positive Action program (Beets et al., 2008; Flay, Allred, & Ordway, 2001). Therefore, young persons' risk for long-term health consequences, for reasons completely outside of their own capacity, could be mitigated.

Table 4.1. Descriptive statistics for time-varying study variables, *M*(sd)

Time-varying covariates	**Wave 5**	**Wave 6**	**Wave 7**	**Wave 8**				
Cigarette use	.84 (2.0)	1.7 (7.7)	1.4 (7.0)	1.0 (2.2)				
Alcohol use	1.4 (1.3)	1.6 (1.6)	1.7 (1.6)	1.7 (1.6)				
Marijuana use	1.6 (1.3)	1.7 (1.8)	1.7 (1.8)	1.7 (1.9)				
Depressive symptoms	1.7 (.6)	1.7 (.6)	1.7 (.6)	1.7 (.6)				
Time-varying outcome variables					**Wave 9**	**Wave 10**	**Wave 11**	**Wave 12**
Violent perpetration					1.2 (.3)	1.2 (.3)	1.2 (.4)	1.2 (.3)
Substance use					2.6 (3.9)	3.1 (4.2)	3.2 (4.2)	2.7 (3.9)
Depressive symptoms					1.6 (.5)	1.6 (.5)	1.6 (.5)	1.6 (.5)

Table 4.2. Summary of multilevel mixed-effects linear regression analysis for covariates predicting violent behavior in early-adulthood (*N* = 620)

Parameter	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	1.15	1.06	1.06	1.07	1.07
	(.01)	(.05)	(.05)	(.05)	(.05)
Level 1					
Time	.02	.03	.03	.02	.02
	(.01)	(.01)	(.01)	(.01)	(.01)
Time^2	-.01	-.01	-.01	0.01	-.01
	(.01)	(.01)	(.01)	(.01)	(.01)
Level 2					
Violent behavior in early-adolescence		.05***	.04**	.04**	.04**
		(.02)	(.02)	(.02)	(.02)
Cigarette use in early-adolescence		.01	.01	.01	.01
		(.01)	(.01)	(.01)	(.01)
Marijuana use in early-adolescence		.01	.01	.01	.01
		(.01)	(.01)	(.01)	(.01)
Alcohol use in early-adolescence		.01	.01	.01	.01
		(.01)	(.01)	(.01)	(.01)
Depression in early-adolescence		.01	.01	.01	.01
		(.01)	(.01)	(.01)	(.01)
High school graduate, or equivalent		-.07**	-.06**	-.06**	-.06**
		(.02)	(.02)	(.02)	(.02)
Black		.03	.03	.03	.03
		(.02)	(.02)	(.02)	(.02)
Male		.08***	.07***	.07***	.07***
		(.02)	(.02)	(.02)	(.02)
Poverty in early-adolescence		-.01	-.01	-.01	-.01
		(.01)	(.01)	(.01)	(.01)
Latent profile analysis groups					
Low exposure to violence (REF)			--		--
Medium exposure to violence			.04	.02	-.01
			(.03)	(.03)	(.04)
High exposure to violence			.15***	.16***	.16***
			(.04)	(.05)	(.05)
Low exposure to violence*time (REF)					
Medium exposure to violence*time				.02	.09*
				(.02)	(.05)
High exposure to violence*time				-.01	-.01
				(.02)	(.06)
Low exposure to violence*time^2 (REF)					--
Medium exposure to violence*time^2					-.03
					(.02)
High exposure to violence*time^2					-.01
					(.02)
Random effects					
Intercept (τ_{00})	.20***	.19***	.19***	.19***	.19***
Time^2 (τ_{10})	.02***	.02***	.02***	.02***	.02***
Residual (σ^2)	.22***	.23***	.23***	.23***	.23***

Note: *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

Table 4.3. Summary of multilevel mixed-effects linear regression analysis for covariates predicting substance use in early-adulthood (*N* = 620)

Parameter	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	2.64	3.91	3.96	4.24	3.95
	(.13)	(.63)	(.63)	(.63)	(.63)
Level 1					
Time	.75***	.72***	.72***	-.68***	.79***
	(.16)	(.20)	(.20)	(.21)	(.22)
Time^2	-.24***	-.23***	-.23***	-.23***	-.27***
	(.13)	(.06)	(.06)	(.06)	(.07)
Level 2					
Cigarette use in early-adolescence		-.01	-.01	-.01	-.01
		(.01)	(.01)	(.01)	(.01)
Marijuana use in early-adolescence		.24***	.25***	.25***	.25***
		(.05)	(.05)	.05)	(.05)
Alcohol use in early-adolescence		.10	.10	.10	.11
		(.06)	(.06)	(.06)	(.06)
Depression in early-adolescence		.01	.01	.02	.02
		(.14)	(.14)	(.14)	(.14)
High school graduate, or equivalent		-.23	-.27	-.27	-.27
		(.27)	(.27)	(.27)	(.27)
Black		-.89**	-.88**	-0.88**	-.87**
		(.31)	(.31)	(.31)	(.24)
Male		-.19	-.13	-.13	-.13
		(.24)	(.24)	(.24)	(.24)
Poverty in early-adolescence		-.01	-.01	-.01	-.01
		(.01)	(.01)	(.01)	(.01)
Latent profile analysis groups					
Low exposure to violence (REF)			--		--
Medium exposure to violence			-.66	-71	-.64
			(.37)	(.45)	(.50)
High exposure to violence			-.27	-.01	-.44
			(.50)	(.60)	(.66)
Low exposure to violence*time (REF)				--	--
Medium exposure to violence*time				.03	-.18
				(.20)	(.65)
High exposure to violence*time				.49	-.93
				(.26)	(.85)
Low exposure to violence*time^2 (REF)					
Medium exposure to violence*time^2					.07
					(.21)
High exposure to violence*time^2					.47
					(.27)
Random effects					
Intercept (τ_{00})	2.55***	2.30***	2.28***	2.28***	2.28***
Time (τ_{10})	.49***	.55***	.55***	.54***	.54***
Residual (σ^2)	2.97***	3.22***	3.22***	3.22***	3.21***

Note: *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

Table 4.4. Summary of multilevel mixed-effects linear regression analysis for covariates predicting depression in early-adulthood (*N* = 620)

Parameter	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	1.64	1.54	1.54	1.54	1.54
	(.02)	(.08)	(.08)	(.08)	(.08)
Level 1					
Time	-.01	-.01	-.01	-.01	.01
	(.02)	(.02)	(.02)	(.02)	(.03)
$Time^2$	-.01	-.01	-.01	-.01	-.01
	(.01)	(.01)	(.01)	(.01)	(.01)
Level 2					
Cigarette use in early-adolescence		.01***	.01***	.01***	.01***
		(.01)	(.01)	(.01)	(.01)
Marijuana use in early-adolescence		.01	-.01	-.01	-.01
		(.01)	(.01)	(.01)	(.01)
Alcohol use in early-adolescence		.01	.01	.01	.01
		(.01)	(.01)	(.01)	(.01)
Depression in early-adolescence		.09***	.09***	.09***	.09***
		(.02)	(.02)	(.02)	(.02)
High school graduate, or equivalent		.05	.05	.05	.05
		(.04)	(.03)	(.03)	(.03)
Black		.01	.01	.01	.01
		(.04)	(.04)	(.04	(.04)
Male		-.08**	-.09**	-.09**	-.09**
		(.03)	(.03)	(.04)	(.03)
Poverty in early-adolescence		-.01	-.01	-.01	-.01
		(.01)	(.01)	(.01)	(.01)
Latent profile analysis groups					
Low exposure to violence (REF)			--	--	--
Medium exposure to violence			.02	.05	.05
			(.05)	(.06)	(.06)
High exposure to violence			.08	.04	.05
			(.06)	(.07)	(.08)
Low exposure to violence*time (REF)				--	--
Medium exposure to violence*time				-.02	-.03
				(.02)	(.07)
High exposure to violence*time				.03	-.01
				(.03)	(.10)
Low exposure to violence*$time^2$ (REF)					--
Medium exposure to violence*$time^2$					.01
					(.02)
High exposure to violence*$time^2$					.01
					(.03)
Random effects					
Intercept (τ_{00})	.33***	.31***	.31***	.31***	.31***
$Time^2$ (τ_{10})	.02***	.02***	.02***	.02***	.02***
Residual (σ^2)	.37***	.37***	.37***	.37***	.37***

Note: *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

References:

Achenbach, T. M. (1991). Manual for the Child Behavior Checklist/4-18 and 1991 profile.

Aisenberg, E., Gavin, A., Mehrotra, G., & Bowman, J. (2011). Defining Violence. In T. I. Herrenkohl, E. Aisenberg, J. H. Williams, & J. M. Jenson (Eds.), *Violence in context: Current evidence on risk, protection, and prevention* (pp. 13–26). New York, New York: Oxford University Press.

Anderson, E. (2000). Code of the street: Decency, violence, and the moral life of the inner city.

Angst, J., Gamma, A., Gastpar, M., Lépine, J.-P., Mendlewicz, J., & Tylee, A. (2002). Gender differences in depression. *European Archives of Psychiatry and Clinical Neuroscience*, *252*(5), 201–209.

Bandura, A. (1973). Aggression: A social learning analysis.

Beets, M. W., Flay, B. R., Vuchinich, S., Acock, A. C., Li, K.-K., & Allred, C. (2008). School climate and teachers' beliefs and attitudes associated with implementation of the positive action program: A diffusion of innovations model. *Prevention Science*, *9*(4), 264–275.

Berton, M. W., & Stabb, S. D. (1996). Exposure to violence and post-traumatic stress disorder in urban adolescents. *Adolescence*, *31*(122), 489.

Boxer, P., Morris, A. S., Terranova, A. M., Kithakye, M., Savoy, S. C., & McFaul, A. F. (2008). Coping with exposure to violence: Relations to emotional symptoms and aggression in three urban samples. *Journal of Child and Family Studies*, *17*(6), 881–893.

Bronfenbrenner, U. (1986). Recent advances in research on the ecology of human development, 287–309. http://doi.org/10.1007/978-3-662-02475-1

Bronfenbrenner, U., & Morris, P. A. (2006). The bioecological model of human development. (W. Damon & R. M. Lerner, Eds.). Hoboken, NJ, USA: Wiley Online Library. http://doi.org/10.1002/9780470147658

Bryant, A. L., Schulenberg, J., Bachman, J. G., O'Malley, P. M., & Johnston, L. D. (2000). Understanding the links among school misbehavior, academic achievement, and cigarette use: A national panel study of adolescents. *Prevention Science*, *1*(2), 71–87.

Cooley-Quille, M., Boyd, R. C., Frantz, E., & Walsh, J. (2001). Emotional and behavioral impact of exposure to community violence in inner-city adolescents. *Journal of Clinical Child & Adolescent Psychology*, *30*(2), 199–206.

Covey, H. C., Menard, S., & Franzese, R. J. (2013). Effects of adolescent physical abuse, exposure to neighborhood violence, and witnessing parental violence on adult socioeconomic status. *Child Maltreatment*, 1077559513477914.

Derogatis, L. R., & Spencer, P. M. (1993). Brief symptom inventory: BSI.

Diez Roux, A. V., Nieto, F. J., Muntaner, C., Tyroler, H. A., Comstock, G. W., Shahar, E., et al. (1997). Neighborhood environments and coronary heart disease: a multilevel analysis. *American Journal of Epidemiology*, *146*(1), 48–63.

Flay, B. R., Allred, C. G., & Ordway, N. (2001). Effects of the Positive Action program on achievement and discipline: Two matched-control comparisons. *Prevention Science*, *2*(2), 71–89.

Fletcher, J. M. (2008). Adolescent depression: diagnosis, treatment, and educational attainment. *Health Economics*, *17*(11), 1215–1235.

Galea, S., Ahern, J., Tracy, M., & Vlahov, D. (2007). Neighborhood income and income distribution and the use of cigarettes, alcohol, and marijuana. *American Journal of Preventive Medicine*, *32*(6), S195–S202.

Gaylord-Harden, N. K., Cunningham, J. A., & Zelencik, B. (2011). Effects of exposure to community violence on internalizing symptoms: does desensitization to violence occur in African American youth? *Journal of Abnormal Child Psychology*, *39*(5), 711–719.
Goldmann, E., & Galea, S. (2014). Mental Health Consequences of Disasters. *Annual Review of Public Health*, *35*(1), 169–183. http://doi.org/10.1146/annurev-publhealth-032013-182435
Gorman-Smith, D., Henry, D. B., & Tolan, P. H. (2004). Exposure to community violence and violence perpetration: The protective effects of family functioning. *Journal of Clinical Child & Adolescent Psychology*, *33*(3), 439–449.
Huesmann, L. R. (1988). An information processing model for the development of aggression. *Aggressive Behavior*, *14*(1), 13–24.
Johnson, J. D., Adams, M. S., Hall, W., & Ashburn, L. (2010). Race, Media, and Violence: Differential Racial Effects of Exposure to Violent News Stories. *Basic and Applied Social Psychology*, *19*(1), 81–90. http://doi.org/10.1207/s15324834basp1901_6
Khantzian, E. J. (1997). The self-medication hypothesis of substance use disorders: a reconsideration and recent applications. *Harvard Review of Psychiatry*, *4*(5), 231–244.
Kliewer, W., & Lepore, S. J. (2015). Exposure to violence, social cognitive processing, and sleep problems in urban adolescents. *Journal of Youth and Adolescence*, *44*(2), 507–517.
Kliewer, W., Lepore, S. J., Oskin, D., & Johnson, P. D. (1998). The role of social and cognitive processes in children's adjustment to community violence. *Journal of Consulting and Clinical Psychology*, *66*(1), 199.
Krug, E. G., Mercy, J. A., Dahlberg, L. L., & Zwi, A. B. (2002). The world report on violence and health. *The Lancet*, *360*. Retrieved from http://www.sciencedirect.com/science/article/pii/S0140673602111330
Lynch, M., & Cicchetti, D. (1998). An ecological-transactional analysis of children and contexts: The longitudinal interplay among child maltreatment, community violence, and children's symptomatology. *Development and Psychopathology*, *10*(02), 235–257.
Margolin, G., & Gordis, E. B. (2000). The effects of family and community violence on children. *Annual Review of Psychology*, *51*(1), 445–479.
Menard, S. (2012). Age, criminal victimization, and offending: Changing relationships from adolescence to middle adulthood. *Victims & Offenders*, *7*(3), 227–254.
Menard, S., Covey, H. C., & Franzese, R. J. (2015). Adolescent exposure to violence and adult illicit drug use. *Child Abuse & Neglect*, *42*, 30–39.
Miech, R. A., Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2015). Monitoring the Future national survey results on drug use, 1975–2014: Volume I, Secondary school students. *Ann Arbor, MI: Institute for Social Research, the University of Michigan*.
Nakao, K., & Treas, J. (1992). The 1989 socioeconomic index of occupations: Construction from the 1989 occupational prestige scores.
Nemeroff, C. B. (2004). Neurobiological consequences of childhood trauma. *Journal of Clinical Psychiatry*, *65*(Suppl. 1), 18–28.
Ng-Mak, D. S., Salzinger, S., Feldman, R. S., & Stueve, C. (2004). Pathologic adaptation to community violence among inner-city youth. *American Journal of Orthopsychiatry*, *74*(2), 196.
Ozer, E. J., & Weinstein, R. S. (2004). Urban adolescents' exposure to community violence: The role of support, school safety, and social constraints in a school-based sample of boys and girls. *Journal of Clinical Child & Adolescent Psychology*, *33*(3), 463–476.

Reynolds, L. K., O'Koon, J. H., Papademetriou, E., Szczygiel, S., & Grant, K. E. (2001). Stress and somatic complaints in low-income urban adolescents. *Journal of Youth and Adolescence*, *30*(4), 499–514.

Sabbagh, L. (2006). The teen brain, hard at work. *Scientific American Mind*, *17*(4), 20–25.

Sallis, J. F., Owen, N., & Fisher, E. B. (2008). Ecological models of health behavior. *Health Behavior and Health Education: Theory, Research, and Practice*, *4*, 465–486.

Shiffman, S. (1993). Assessing smoking patterns and motives. *Journal of Consulting and Clinical Psychology*, *61*(5), 732.

Substance Abuse and Mental Health Services Administration. (2015). Results from the 2013 National Survey on Drug Use and Health: summary of national findings. NSDUH series H-48 2014; HHS publication (SMA) 14–4863. Rockville, MD: Substance Abuse and Mental Health Services Administration, 2014. Available at: https://www.drugabuse.gov/publications/drugfacts/nationwide-trends#asterisk

Terr, L. C. (2003). Childhood traumas: An outline and overview, *1*(3), 322–334.

Thornberry, T. P., Ireland, T. O., & Smith, C. A. (2001). The importance of timing: The varying impact of childhood and adolescent maltreatment on multiple problem outcomes. *Development and Psychopathology*, *13*(4), 957–980.

Townsend, L., Flisher, A. J., & King, G. (2007). A systematic review of the relationship between high school dropout and substance use. *Clinical Child and Family Psychology Review*, *10*(4), 295–317.

Vermeiren, R., Schwab-Stone, M., Deboutte, D., Leckman, P. E., & Ruchkin, V. (2003). Violence exposure and substance use in adolescents: findings from three countries. *Pediatrics*, *111*(3), 535–540.

Wills, T. A., & Shiffman, S. (1985). Coping and substance use: A conceptual framework. *Coping and Substance Use*, 3–24.

Wolfe, D. A., Crooks, C. V., Lee, V., McIntyre-Smith, A., & Jaffe, P. G. (2003). The effects of children's exposure to domestic violence: A meta-analysis and critique. *Clinical Child and Family Psychology Review*, *6*(3), 171–187.

Wright, R. J. (1998). Exposure to violence. *The British Journal of Psychiatry*, *184*, 169–175.

Xue, Y., Zimmerman, M. A., & Cunningham, R. (2009). Relationship between alcohol use and violent behavior among urban African American youths from adolescence to emerging adulthood: A longitudinal study. *American Journal of Public Health*, *99*(11), 2041–2048.

Zimmerman, M. A., Caldwell, C. H., & Bernat, D. H. (2002). Discrepancy Between Self-Report and School-Record Grade Point Average: Correlates With Psychosocial Outcomes Among African American Adolescents1. *Journal of Applied Social Psychology*, *32*(1), 86–109.

Chapter 5: Conclusion

In this dissertation, we learned that exposure to violence can be a painful and stressful experience that has lasting consequences for many years during some of the most informative stages in one's life. I found that exposure to violence during emerging adulthood is associated with higher and increasing rates of violence perpetration in early-adulthood, both of which increase one's risk of involvement in the criminal justice system.

Black and minority youth are dying from violence at unacceptable rates and the problem is not improving. In 2013, more young Black American males died from violent-related injuries than unintentional injuries (e.g., car crashes, poisonings), heart disease, HIV, and cancer combined (2,761 and 1,677, respectively) (Centers for Disease Control and Prevention, 2014). Even though researchers have made great strides with prevention efforts over the past two decades, rates of fatal violence-related deaths among all 15 to 29 year-olds have virtually remained unchanged between 1999 and 2014 (Centers for Disease Control and Prevention, 2016). Thus, public health practitioners might strengthen their intervention efforts to protect youth most at risk for violence perpetration and its sequelae to better understand how exposure to violence may contribute youth violence perpetration.

Exposure to violence is the most frequently reported stressor in the lives of young African Americans living in high-crime and low-economic communities (Sanchez, Lambert, & Cooley-Strickland, 2013). In fact, among inner-city youth in some American communities, rates of exposure to violence can be as high as 81% (Schubiner, Scott, & Tzelepis, 1993). Although exposure to violence has been linked to many negative outcomes, few researchers have investigated exposure to violence in an adequate way to make clear, long-term associations. For example, Vermeiren and colleagues (2003) conducted a three-country study and found an

association between witnessing violence and substance use (i.e., cigarette, alcohol, and marijuana use) in Arkangelsk, Russia and Antwerp, Belgium, but not in New Haven, United States. While these findings are interesting by identifying a possible association between exposure to violence and substance use, the study was cross-sectional, thereby limiting potential conclusions. Furthermore, their measure of violence exposure was limited. They only asked whether the 15 year-olds had ever been exposed to six different forms of violence, while the youth could have been exposed to a single form of violence multiple times which was not accounted for in their analysis. Consequently, youth exposed to one type of violence 10 times may have received a lower score on this measure than one exposed to two forms of violence only once (Vermeiren, Schwab-Stone, Deboutte, Leckman, & Ruchkin, 2003).

While this is just one example, Vermeiren and colleague's study highlights several limitations that researchers often face when studying exposure to violence. First, many of such studies are limited by poor measurement tools (Hastings & Kelley, 1997). For instance, tools that measure exposure to violence are often narrow in scope and focus on only one specific domain (e.g., sexual, community, family) instead of several different domains of exposure (Aisenberg, Gavin, Mehrotra, & Bowman, 2011; Terr, 2003). Often, researchers simply sum binary indicators of exposure to violence to generate an overall score (Wright, 1998). Potentially important information is lost when taking this analytical approach because one cannot determine a potential differential effect of experiencing acute versus chronic exposures, and the researcher cannot capture the effect of salient versus less prominent events. When exploring the literature, I did not find a single study that attempted to parse concurrent forms of exposure to violence. Moreover, many measures do not allow researchers to study the effects of exposure to violence across simultaneous different domains of exposure (e.g. home, school, and community).

Another limitation of prior studies of the effects of exposure to violence is that few investigate exposure to violence longitudinally, and even fewer studies span several years (Kitzmann, Gaylord, Holt, & Kenny, 2003). For example, when researchers investigate exposure to violence studies longitudinally, participants are often only surveyed into adolescence, or in the rare occasion, into their late teenage years (Kitzmann, Gaylord, Holt, & Kenny, 2003; Yates, Dodds, Sroufe, & Egeland, 2003). This is problematic because the effects of violence exposure differ by various stages of development (Sabbagh, 2006). Moreover, researchers have found that behaviors are not static over time, and may, in fact, change from one stage of development to another (Mistry et al., 2015). Finally, when studying exposure to violence, which can be a traumatic experience, the effects of exposure to violence may span many years. By only studying exposure to violence during one point in time, the effects of the trauma may not yet have manifested in the victim. Before researchers can start making statements of association between exposure to violence and other health outcomes, the limitations mentioned above must be addressed.

In this dissertation, I addressed these limitations in two principle ways. First, I used a longitudinal sample that spanned several developmental stages, instead of with a more traditional cross-sectional design or with a longitudinal sample that only spanned five or fewer years. This allows us to begin to make stronger inferences and more confidently connect the findings with implementable solutions. And second, I applied analytical techniques that accounted for concurrent exposures to violence, across multiple domains. I did not simply sum the exposure to violence measures in a binary fashion, as is often the case. Instead, I used an average frequency scale for each of the three domains (family conflict, witnessing violence, victimization). This allows researchers to identify patterns of distinctive forms and levels of exposure to violence. By

taking this analytical approach, interventions can be tailored to account for different patterns of exposures to violence in a more timely manner.

Study 1

The first question studied in this dissertation was if being exposed to violence early in life is a risk factor for negative coping behaviors later in life. Researchers have found that experiencing stressful events (either chronic or acute), and the psychological or emotional stress that follows, is strongly associated with substance use (Shiffman, 1993). The stress that results from the trauma may trigger a coping response that increases the risk of substance use, and/or the use of substances to self-medicate. This research question is particularly important because it could help explain why individuals living below the poverty line, who are more likely to experience violence exposure, are at greater risk for substance use disorders. To my knowledge, no one has investigated the association between exposure to violence and substance use across so many developmental stages, while also controlling for changes in substance use throughout the study period. This is an important research question because it help inform early intervene to help protect against later repercussions of exposure.

In this analysis, the findings support the stress-coping model and the self-medication hypothesis. Those with above average rates of exposure to violence in emerging adulthood had an increasing trend in substance use in early-adulthood, after controlling for substance use throughout emerging adulthood. Therefore, it is possible that the trauma experienced during emerging adulthood is salient enough to have lasting negative effects at subsequent developmental stages.

These findings are important because they suggest that practitioners may want to consider tailoring existing adult substance use interventions for those exposed to violence when they were

younger, especially due to the exposure to violence may have lasting repercussions into adulthood. By screening for exposure to violence when an individual enters a substance use treatment program, practitioners may be better equipped to tailor treatment plans to include positive coping strategies, alternative self-medicating lessons, and other evidence-based PTSD treatment procedures. Furthermore, to protect the health and wellbeing of those exposed to violence from subsequent substance use, prevention programs that focus on those exposed to violence could address cigarette, tobacco, and marijuana use.

Study 2

The next gap I focus on in this dissertation was one of measurement. I looked at the traditional approach of how researchers study exposure to violence, and improved on it to capture concurrent exposures of violence across multiple domains. In communities with high rates of violence, it is likely for an individual to experience violence across multiple settings (Lambert, Nylund-Gibson, Copeland-Linder, & Ialongo, 2010). Unfortunately, much of the research on exposure to violence does not account for unique patterns of exposure (Wright, 1998). When researchers simply sum binary exposure to violence scores, and treat different exposures to violence similarly, thereby losing valuable information that could potentially inform future intervention efforts. For example, certain exposures to violence may be associated with differential symptomologies later in life. Additionally, if certain individuals are more likely to experience a specific pattern of exposure to violence, practitioners may be better equipped to identify such individuals and intervene before the youth are exposed to violence. To do this, the analytical approach I took was to conduct several latent profile analyses with three exposure to violence constructs: family conflict, witnessing violence, and victimization.

I conducted seven latent profile analyses on a sample of youth in the Flint Adolescent Study (average age 18 years-old). The best fitting model, after taking into consideration several theoretical and statistical perspectives, was the 3-profile solution. The three groups are: (1) "Low exposure to violence," (2) "Mild exposure to violence with high exposure to family conflict," and (3) "High exposure to violence." After conducting additional analyses, I found that males were more likely to be in the medium and high exposure to violence groups, relative to females, and the groups did not differ by race or by family receiving financial aid. Lastly, the high exposure to violence group had the highest average violence perpetration score, followed by the medium exposure to violence group, then the low exposure to violence group.

By investigating exposure to violence using latent profiles, we learn that it is possible to have multiple concurrent exposures to violence. This analytical approach is novel because researchers have not previously explored how different forms of exposure to violence may occur concurrently, and at varying levels when investigating exposure to violence. It is also significant because it allows researchers to study exposure to violence in a particularly sensitive and nuanced manner, which is particularly important because researchers have found that even low exposures to a risk factor can increase the odds for unintended consequences (Quinlan et al., 2005; Breslau, Chilcoat, Kessler, & Davis, 1999; Moylan, 2010). Therefore, this more nuanced approach to investigation may decrease the odds for subsequent repercussions to exposure to violence, and interventions can be tailored for different patterns and types of exposures. These findings are important because we start to learn how multiple forms of violence may cluster together to form risk. They can help provide a framework for studying how different profiles of exposure may change throughout their life. This approach also allows us to study if different

patterns of distinctive types of violence exposure early in life contribute to health various consequences later in life.

By better understanding that someone with high rates of family conflict is also likely to have high rates of victimization and witnessing violence, interventions could be designed, tailored, and administered early to mitigate long-term consequences. I found that different, co-occurring exposures to violence can exist, allowing health care providers to be less likely to miss identifying exposures to violence, which will increase the chance that the victim receives adequate treatment. By learning the presence of different risk factors for different exposure profiles, tools can be developed to better identify youth at risk for different forms of exposure, and practitioners could be better prepared to intervene before it is too late.

Study 3

The final study of this dissertation expanded on the findings of paper one by applying the latent profiles from paper two as independent variables for violence perpetration, substance use, and depression later in life. This approach is novel and addresses the two main gaps in the literature that this dissertation first identified: poor measurement tools and lack of longitudinal research that spans multiple developmental stages. In this study, I used the latent profiles created in paper 2. To my knowledge, no one has investigated the association between exposure to violence and a host of outcomes (i.e., violence perpetration, substance use, and substance use) across such a long period of time, and using latent profiles as independent variables.

When violence perpetration in early-adulthood was the outcome, I found that those in the high exposure to violence group were at greater risk for violence perpetration in early-adulthood, compared to those in the low exposure to violence group. Moreover, I found that those in the high exposure to violence group had an increasing level of violence perpetration in early-

adulthood, compared to those in the low exposure to violence group. Next, when I investigated the association between exposure to violence latent profiles in late-adolescence and substance use in early-adulthood, I found that those in the high exposure to violence group have an increasing trend in substance use, but it was not significantly different from the low exposure to violence group. Lastly, in the third analysis, I did not find an association between latent profiles in late-adolescence and depression in early-adulthood.

Taken together, the findings in this paper support the claim that scripts learned during emerging adulthood are strong and salient enough that when youth are exposed to violence, we can see lasting effect into early-adulthood. These findings suggest the need to assess exposure to violence early and often in communities with high rates of violence, allowing practitioners to intervene as early as possible. The long-term associations we found are worrying and buttress our call for designing better assessment tools and refined evidence-based interventions.

Dissertation limitations:

Limitations must be mentioned which could limit this dissertation's findings. All of the data used in this dissertation come from the same sample, thereby limiting the dissertation's generalizability. Yet, the data include a large sample of poor, predominantly African Americans over the course of 17 years. A data source with a unique population over such a length of time is rare and offers a rich source of knowledge. While caution should be taken before generalizing the findings to other populations, this dissertation can be used to guide the replication of the findings in other similar population. Additionally, all of the data used in this dissertation are self-reported data. While some believe that self-reported data may be unreliable due to response bias, participants were ensured their responses would be kept confidential due to the certificates of confidentiality obtained, and participants responded to sensitive questions in private, not through

face-to-face interviews, thereby limiting potential response bias. Finally, while I looked at exposure to violence across several domains (i.e., family conflict, witnessing violence, victimization), the construct was still limited by the number of domains measured. There are many more forms of violence exposure I would have liked to include in the construct (e.g., media, school, intimate partner violence), but those data were not available across all of the study waves in the Flint Adolescent Study. Nevertheless, the construct of exposure to violence used in this dissertation is broader than most, and allows us to measure concurrent forms of exposure across several domains (i.e., family conflict, witnessing violence, victimization).

Implications for Practice

Taken together, these three studies suggest that the repercussions of violence exposure may span several years and across developmental stages. In this dissertation, we learned the importance in expanding how researchers measure exposure to violence. Instead of simply summing binary indicators of exposure to violence, it may be more beneficial to measure and account for concurrent forms of violence exposures, and the exposures to violence should come from multiple domains (e.g., home & community). Moreover, by measuring youth violence and other health outcomes across developmental stages, we are better equipped to see how exposure to violence may have lasting effects several years after the trauma.

We learned that individuals may not be destined to have a poorer quality of life because they were the victim of violence exposure when they were 18 years-old. The findings in this dissertation can inform future research to help us better understand youth violence, and can be used to inform interventions to better protect individuals at risk for violence exposure, and protect those who have already been exposed to violence, from experiencing the serious and lasting repercussions that accompany exposure to violence.

Future directions

The results of the three studies in this dissertation suggest several directions for future research. First, researchers do not yet know if specific exposures to violence are more strongly associated with negative outcomes later in life. By studying this, we could be better prepared for early intervention to mitigate potential negative outcomes. To do so, researchers must apply a weight to individuals based on their exposure to violence profiles. The benefit of using a weighted indicator is that the latent profile becomes more reflective of the individual and thus provides a more accurate measure of the salience of exposure to violence.

Second, while I conducted the latent profile analysis in just one wave of data for already mentioned reasons, it would be beneficial to investigate how the latent profiles evolve over time. This could mean one of two things: 1) use several years of data to create latent exposure to violence profiles, thereby perhaps generating a more stable profile, or 2) conducting latent profile analyses at each wave of data to determine how the likelihood of being in one exposure to violence profile is associated with the likelihood of having that same profile, or a different profile, over time. For example, there could be differential repercussions for having a high exposure to violence profile in early-adolescence versus early-adulthood.

Although those at high risk for violence exposure, and those who have already been exposed to violence could benefit from these additional analyses, I did not perform these analyses because researchers have yet to establish if exposure to violence is associated with negative outcomes later in life. Before we study the associations between a weighted exposure to violence measure, and how exposure to violence latent profiles change over time, and how those changes are associated with negative outcomes later in life, we must first establish this initial

relationship. This dissertation was a logical first step before these additional analyses can be performed, which are therefore, beyond the scope of this dissertation.

Another potential future direction is to apply this same research approach to other similar populations to Flint, and to national probability samples representative of the general population. While the Flint Adolescent Study is valuable given the characteristics of the sample, it is important to determine if these effects are unique to Flint, or if they can be replicated in other similar communities. Additionally, can the findings be replicated in a large national study, where the sample will have experienced substantially less violence? In a national probability sample that is representative of the general population, the experiences of violence exposure may be less frequent, more salient, and thus may have greater lasting effects.

Lastly, it may be meaningful to apply this analytical approach to a larger set of exposure to violence indicators. By having additional indicators of exposure to violence, across many more domains of exposure, different and additional latent profiles of exposure to violence may emerge. While our exposure to violence latent profiles yielded three distinct profiles (i.e., low, medium, and high), where the three domains (i.e., family conflict, witnessing violence, and victimization) were universally low, medium, and high, respectively, a more robust set of indicators may produce findings where we do not see universally consistent levels of the indicators across each of the profiles.

Conclusion

In this dissertation, we learned that exposure to violence can be a painful and stressful experience that has lasting consequences for many years during some of the most formative life stages. I found that exposure to violence during emerging adulthood is associated with higher and increasing rates of violence perpetration in early-adulthood, both of which increase one's

risk of involvement in the criminal justice system. Yet, the findings suggest an alternative pathway. These findings can help practitioners quickly identify those at risk for later repercussions following exposure to violence, and enroll those exposed to violence into appropriate interventions. Therefore, we have the potential for these findings to help reduce the negative effects of violence exposure and increase the potential for primary prevention of negative outcomes resulting from violence exposure.

References:

Aisenberg, E., Gavin, A., Mehrotra, G., & Bowman, J. (2011). Defining Violence. In T. I. Herrenkohl, E. Aisenberg, J. H. Williams, & J. M. Jenson (Eds.), *Violence in context: Current evidence on risk, protection, and prevention* (pp. 13–26). New York, New York: Oxford University Press.

Breslau, N., Chilcoat, H. D., Kessler, R. C., & Davis, G. C. (1999). Previous exposure to trauma and PTSD effects of subsequent trauma: results from the Detroit Area Survey of Trauma. *American journal of Psychiatry*, *156*(6), 902-907.

Boxer, P., Morris, A. S., Terranova, A. M., Kithakye, M., Savoy, S. C., & McFaul, A. F. (2008). Coping with exposure to violence: Relations to emotional symptoms and aggression in three urban samples. *Journal of Child and Family Studies*, *17*(6), 881–893.

Centers for Disease Control and Prevention. (2014). Web-based Injury Statistics Query and Reporting System (WISQARS). *National Center for Injury Prevention and Control, Centers for Disease Control and Prevention*. Retrieved from http://www.cdc.gov/injury/wisqars/index.html

Hastings, T. L., & Kelley, M. L. (1997). Development and validation of the Screen for Adolescent Violence Exposure (SAVE). *Journal of Abnormal Child Psychology*, *25*(6), 511–520.

Kitzmann, K. M., Gaylord, N. K., Holt, A. R., & Kenny, E. D. (2003). Child witnesses to domestic violence: a meta-analytic review. *Journal of Consulting and Clinical Psychology*, *71*(2), 339.

Lambert, S. F., Nylund-Gibson, K., Copeland-Linder, N., & Ialongo, N. S. (2010). Patterns of community violence exposure during adolescence. *American Journal of Community Psychology*, *46*(3-4), 289–302.

Mistry, R., Heinze, J. E., Cordova, D., Heish, H.-F., Goldstick, J. E., Ayer, S. M., & Zimmerman, M. A. (2015). Transitions in Current Substance Use from Adolescence to Early-Adulthood. *Journal of Youth and Adolescence*, 1–13.

Moylan, C. A., Herrenkohl, T. I., Sousa, C., Tajima, E. A., Herrenkohl, R. C., & Russo, M. J. (2010). The effects of child abuse and exposure to domestic violence on adolescent internalizing and externalizing behavior problems. *Journal of family Violence*, *25*(1), 53-63.

Perkins, C. A. (1997). Age patterns of victims of serious violent crime.

Quinlan, K. P., Brewer, R. D., Siegel, P., Sleet, D. A., Mokdad, A. H., Shults, R. A., & Flowers, N. (2005). Alcohol-impaired driving among US adults, 1993–2002. *American journal of preventive medicine*, *28*(4), 346-350.

Sabbagh, L. (2006). The teen brain, hard at work. *Scientific American Mind*, *17*(4), 20–25.

Sanchez, Y. M., Lambert, S. F., & Cooley-Strickland, M. (2013). Adverse life events, coping and internalizing and externalizing behaviors in urban African American youth. *Journal of Child and Family Studies*, *22*(1), 38–47.

Schubiner, H., Scott, R., & Tzelepis, A. (1993). Exposure to violence among inner-city youth. *Journal of Adolescent Health*, *14*(3), 214–219.

Shiffman, S. (1993). Assessing smoking patterns and motives. *Journal of Consulting and Clinical Psychology*, *61*(5), 732.

Terr, L. C. (2003). Childhood traumas: An outline and overview, *1*(3), 322–334.

Vermeiren, R., Schwab-Stone, M., Deboutte, D., Leckman, P. E., & Ruchkin, V. (2003).

Violence exposure and substance use in adolescents: findings from three countries. *Pediatrics*, *111*(3), 535–540.
Wright, R. J. (1998). Exposure to violence. *The British Journal of Psychiatry*, *184*, 169–175.
Yates, T. M., Dodds, M. F., Sroufe, L. A., & Egeland, B. (2003). Exposure to partner violence and child behavior problems: A prospective study controlling for child physical abuse and neglect, child cognitive ability, socioeconomic status, and life stress. *Development and Psychopathology*, *15*(01), 199–218.