

University of Nevada, Reno

Childhood adversity, substance use, and mental health problems: The protective influence of resilience and assets

A dissertation submitted in partial fulfillment of
the requirements for the degree of Doctor of Philosophy in
Public Health

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May 2020



THE GRADUATE SCHOOL

We recommend that the dissertation
prepared under our supervision by

entitled

be accepted in partial fulfillment of the
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ABSTRACT

Youth exposed to childhood adversity are at increased risk for substance use and mental health problems. There is increasing evidence that resilience and youth assets can offer protection; however, few studies have examined whether such protective factors can modify the influence of childhood adversity on substance use and mental health problems. The main aims pursued in my dissertation were to: 1) determine whether resilience and assets offer protection against substance use and mental health problems in the face of adversity (direct protective effect), 2) determine whether resilience or assets can buffer the relationship between adversity and substance use and mental health problems (interactive protective effect).

To achieve these aims, data from three separate studies were analyzed. In the first cohort study of 1,111 youth, I assessed the direct and interacting influence of assets within individual, family, and community domains on the relationship between negative life events and binge drinking using generalized estimating equation (GEE) models. In the second study, I used data from large, representative samples of approximately 5,000 middle school and 5,000 high school youth in Nevada to evaluate the direct and interacting influence of family communication and school connectedness on the relationship between adverse childhood experiences (ACEs) and suicidal behaviors using GEE models. In the third study, I used data from a sample of juvenile justice involved youth to assess the direct and interacting influence of internal resilience and four assets on the relationship between (ACEs) and co-occurrence of substance abuse and

psychological distress using multinomial logistic regression. Interaction was assessed on the multiplicative and additive scales; relative excess risk due to interaction (RERI) was used to evaluate additive interaction.

In all three studies, there was evidence that resilience and assets offered direct protection against substance use and mental health problems in the presence of adversity (aim 1). In the second and third study, there was also evidence of buffering by resilience and/or assets on the multiplicative scale (aim 2). Despite the protective influence of resilience and assets, childhood adversity (particularly ACEs) continued to be a strong predictor of substance use, mental health problems, and co-occurrence.

The findings highlight the need for the development, implementation, and evaluation of strength-based interventions designed to build resilience and assets among youth. Given the negative influence of adversity on substance use and mental health problems, trauma-informed interventions are also warranted, especially for juvenile justice involved youth.

ACKNOWLEDGEMENTS

I would like to extend my deepest gratitude to my advisor and committee chair, Dr. Kristen Clements-Nolle, for her mentorship, guidance, and support throughout my graduate studies. Thank you for pushing me to be the best that I can be. I would also like to extend the same gratitude to my committee members, Dr. William Evans, Dr. Minggen Lu, Dr. Roy Oman, and Dr. Wei Yang, for their expertise, feedback, and advice. Finally, I would like to acknowledge my family and friends for their love, support, and constant encouragement. Thank you for always believing in me.

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Chapter 1

Introduction

INTRODUCTION

Over the past two decades, the life course perspective has emerged as a prominent framework that guides research of human health in the biological, physical, and social sciences.^{1,2} Within the life course framework, adolescence is recognized as a sensitive developmental stage in which social and cognitive skills, attitudes and values, habits, and behaviors are easily acquired and have profound impacts on health and well-being at later stages of life.¹ For example, it is well established that substance use behaviors and mental health problems acquired during adolescence can contribute to morbidity and mortality in adulthood.³⁻⁵ Longitudinal data demonstrate that alcohol-related problems during adolescence predict alcohol dependence in early adulthood.⁶ Furthermore, existing evidence suggests the onset of mental health problems dramatically increases during mid-to-late adolescence and remains relatively stable thereafter.^{7,8}

Unfortunately, substance use and mental health problems are not uncommon among youth in the United States. Underage drinking is responsible for about 10% of all alcohol consumed in the United States, and most of this comes in the form of binge drinking.⁹ Youth binge drinking is a major public health problem and national estimates suggest that 14% of high school students participated in binge drinking in the past 30 days.¹⁰ Further, it is estimated that about 4% of adolescents in the United States met the DSM criteria for having an alcohol or illicit drug use disorder in the past year, representing more than 1 million youth.^{11,12}

In terms of mental health problems, national estimates suggest that approximately 32% of adolescents have experienced an anxiety disorder, 20% have experienced a behavior disorder, and 14% have experienced a mood disorder in their lifetime, with 20% of youth experiencing serious impairment from these disorders.¹³ Further, in 2018, suicide was the second leading cause of death among adolescents and young adults in the United States.¹⁴ It is also common for substance use and mental health problems to co-occur in youth. Among adolescents in the United States with a substance use disorder, approximately one-third also experience a mental health problem.¹⁵ The prevalence of co-occurrence is even higher among populations of juvenile justice involved youth, where more than half of youth with substance use disorders also have a mental health problem.¹⁶

Substance use and mental health problems that develop in adolescence may continue into adulthood and have major health and financial implications. In 2010, drug use disorders, major depressive disorders, and anxiety disorders independently ranked in the top 15 leading causes of disability-adjusted life-years (DALYs) for adults in the United States.¹⁷ Recent estimates suggest the economic burden of substance use and mental health problems top more than 1 trillion dollars in the United States.¹⁸⁻²⁰ Thus, there is a clear need to identify factors associated with adolescent behavioral health problems that will guide prevention efforts to reduce the burden of these problems across the lifespan.

There is evidence that exposure to adversity during childhood and adolescence contributes to the development of substance use and mental health

problems.²¹ Negative life events (NLEs), such as breaking up with a significant other or moving to another school or city, and adverse childhood experiences (ACEs), including abuse, neglect, and household dysfunction, are two specific forms of adversity that have demonstrated associations with substance use and mental health problems among adolescents.²²⁻²⁴ These forms of adversity are common experiences for adolescents, with estimates suggesting that nearly 75% of youth have experienced at least one NLE²⁵ and 50% have experienced at least one ACE.²⁶

There is evidence linking NLEs and ACEs to a range of substance use and mental health problems in youth populations, including binge drinking,²² illicit drug use,^{23,27} substance abuse and dependence,²⁸ suicidal behavior,^{29,30} and conduct disorders.²² In addition to this epidemiologic evidence, there is neurobiological evidence suggesting that stress associated with ACEs can have detrimental neurodevelopmental influences on the developing adolescent brain.³¹ Specifically, ACEs can overstimulate “fight-or-flight” adrenal responses that result in disruption of neural networks and neuroendocrine pathways, beginning a chain of negative processes that lead to poor behaviors and health across the lifespan.³¹

Despite the negative impact adversity has on developmental processes, some youth who have chronic exposure to adversity are resilient and grow into healthy adults.³² Resilience is a multidimensional construct that reflects one’s ability to adapt or cope in the presence of chronic stress or adversity.³³ Resilience theory provides a strength-based, conceptual framework for studying

mechanisms through which youth can overcome chronic exposure to risk and adversity.^{32,34-37} One goal of resilience theory is to understand promotive factors, which represent factors across individual and environmental domains that can disrupt risk and foster good health practices.³²

Similar to resilience theory, positive youth development seeks to help youth engage in positive and productive activities rather than focusing all efforts on preventing them from engaging in risky behaviors.³⁸⁻⁴⁰ One lineage of positive youth development programming specifically addresses youth risk reduction by building and strengthening “youth assets”. Youth assets represent the relationships, skills, and opportunities that guide youth through challenges and obstacles during adolescence and help them to transition into successful adults.³⁹⁻⁴³ Assets are theorized to operate within individual, family, and community domains, and include attributes such as aspirations for the future, family communication, and community involvement. This multi-level perspective is similar to that of the socio-ecological approach toward understanding risk and protective factors for risky behaviors and poor health outcomes.^{44,45} Given that primary prevention of childhood adversity is difficult, dedicating efforts to secondary prevention to reduce the impact of childhood adversity on health and well-being through resilience and youth assets is paramount.⁴⁶

There is a growing body of evidence suggesting that resilience and assets can protect youth from engaging in risky behaviors and experiencing poor health outcomes, including substance use and mental health.^{42,47-50} However, few studies have examined how resilience and youth assets influence associations

between childhood adversity and substance use and mental health problems during adolescence. Broadly speaking, the three studies in this dissertation investigate two general aims: 1) to explore whether resilience and/or youth assets can offer protection against substance use and mental health problems in the face of adversity (direct protective effect); and 2) to explore whether resilience and/or assets can buffer the relationship between adversity and substance use and mental health problems (interacting protective effect).

In the first study, I prospectively examined the direct and interacting influence of youth assets on the association between NLEs and binge drinking among youth using generalized estimating equations (GEE) models. Data for this study were obtained from a community-based, longitudinal cohort of 1,111 youth that measured, seventeen youth assets across individual, family, and community domains using multi-items constructs with established validity and reliability. In the second study, GEE models were used to estimate the direct and interacting effects of family communication and school connectedness on the relationship between ACEs and suicidal behaviors in representative, school-based samples of approximately 5,000 middle school and 5,000 high school youth in Nevada. In the third study, multinomial logistic regression models were used to estimate the direct and interacting influence of internal resilience and external youth assets on the association between ACEs and co-occurrence of psychological distress and substance abuse in a population of more than 400 youth involved in the juvenile justice system.

The interacting effect of resilience and/or assets was assessed on the multiplicative (ratio) scale in all three studies and on the additive (difference) scale in the second and third studies. The relative excess risk due to interaction (RERI) method was used to evaluate additive interaction.⁵¹ Additive interaction is more informative for assessing the public health impact of interaction, but it is rarely reported in epidemiologic studies.⁵² The following three chapters will present each of these studies in complete detail and will be followed by a concluding chapter that includes a summary of findings, directions for future research, and public health implications.

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Chapter 2

Prospective relationships between youth assets, negative life events, and binge drinking in a longitudinal cohort of youth

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Accepted for publication in *Annals of Epidemiology*.

Funding Statement: This study was supported by funding from the Centers for Disease Control and Prevention grant number 5 U01 DP000132. The contents of this publication are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention.

ABSTRACT

Purpose: To investigate whether individual, family, and community assets can: 1) protect youth from binge drinking in the face of negative life events; and 2) modify the relationship between negative life events and binge drinking.

Methods: Data from waves 2-5 of the Youth Asset Study were analyzed. Generalized estimating equations were used to assess the relationship between negative life events, assets, and binge drinking. Multiplicative and additive interaction between negative life events and assets was evaluated.

Results: When included in the same model as negative life events, individual, family, and community assets had a graded, protective relationship with binge drinking, with strongest protection for those with the greatest number of assets. For example, youth with 3 [Adjusted odds ratio (AOR):0.78, 95% confidence interval (CI): 0.65-0.93], 4 [AOR:0.60, 95% CI: 0.49-0.73], 5 [AOR:0.53, 95% CI: 0.41-0.69], and 6 [AOR:0.42, 95% CI: 0.28-0.63] assets within the community domain had a significantly lower odds of binge drinking compared to youth with 0-2 community assets. No significant interactions were observed.

Conclusions: The findings suggest that while youth who are exposed to negative life events are at risk for binge drinking, building assets across individual, family, and community domains can have a protective influence.

INTRODUCTION

Alcohol is the most commonly used substance among youth in the United States.¹ Of all alcohol consumed by 12-17 year olds, 90% is in the form of binge drinking, which is commonly defined as having five or more drinks in a row.¹ In 2018, 3.7% of 8th graders, 8.7% of 10th graders, and 13.8% of 12th graders reported binge drinking in the past 30 days.¹ Emerging evidence suggests that binge drinking at an early age can negatively affect brain structure and neurodevelopment.²⁻⁴ Binge drinking during adolescence also is associated with a range of risk behaviors and poor emotional health outcomes. Youth who engage in binge drinking are more likely to use tobacco,⁵⁻⁷ use illicit drugs,^{6,7} engage in suicidal behaviors^{6,8} and risky sexual behaviors,^{6,9} and be a victim of physical or sexual dating violence.^{6,10}

One of the mechanisms thought to exacerbate youth alcohol consumption, including binge drinking, is the stress associated with experiencing negative life events.¹¹ Negative life events (NLEs) are observable, acute changes in one's environment or social context.¹² For adolescents, NLEs can include events such as the death of a family member or close friend, parental divorce or separation, experiencing problems at school, or moving to a new school or a new city. Although NLEs are acute events, their effects can lead to chronic stress and development of unhealthy coping behaviors such as binge drinking that can result in poor physical, emotional, and social health over time.¹³⁻¹⁷ Additionally, certain NLEs, including parental divorce and major changes in family finances, are markers for socioeconomic problems and other NLEs are more common

among youth with low socioeconomic status.¹⁸ Therefore, socioeconomic hardship is another mechanism that may link NLEs with binge drinking.¹⁹

Studies have identified many NLEs as risk factors for alcohol use and binge drinking, including experiencing a romantic breakup,^{15,17} health-related stress,¹⁷ problems in school,^{15,20} conflict at home,¹⁵ death of a family member or close friend,^{15,20} and having a parent/guardian gain a new spouse or partner.¹⁵ Further, research has demonstrated graded associations between cumulative NLEs and alcohol use behaviors, including binge drinking.^{15,16,21}

In addition to identifying negative stressors that may lead to binge drinking, it is important to study positive factors that may reduce adolescent binge drinking to guide prevention efforts.²² Youth assets are skills, competencies, relationships, and opportunities that operate within individual, family, and community domains to positively influence health behaviors.²³⁻²⁶ Research from the positive youth development field suggests that youth assets can guide youth through challenges and obstacles during adolescence and help them to successfully transition into adulthood.²⁵ Previous studies have identified a wide range of youth assets, including responsible decision-making, family communication, and community involvement, as protective factors for many risk behaviors, including alcohol use and binge drinking.²⁷⁻³¹

While studies have identified protective associations between youth assets and binge drinking among youth, research has not investigated whether youth assets can protect youth from binge drinking in the face of NLEs or modify the relationship between NLEs and binge drinking. Using data from a longitudinal

study of youth, our primary objectives were to: 1) assess whether cumulative exposure to youth assets within individual, family, and community domains offer independent protection from binge drinking when NLEs are present (compensatory effect); and 2) test for interaction between cumulative exposure to individual, family, and community youth assets and NLEs on binge drinking (buffering effect).

METHODS

Participants and Procedures

The Youth Asset Study (YAS) was a longitudinal cohort study conducted between 2003/2004 and 2008/2009 that was designed to investigate the prospective influence of youth assets across individual, family, and community domains on a range of risk behaviors.³² To obtain a racially/ethnically diverse sample of participants, census tracts in Oklahoma City were stratified by race/ethnicity and income and 20 census tracts were randomly sampled. Within sampled census tracts, trained interviewers approached all households to determine eligibility. Households with one English- or Spanish-speaking youth between the ages of 12-17 and at least one parent were eligible for participation. Only one youth and one parent from each household completed the survey. Within households with multiple eligible youth, one youth was randomly chosen using a random number generator.

A total 20,041 residences were selected for study participation, but 18,128 did not have a youth between the ages of 12-17.³² Of the 1,913 remaining residences, the eligibility of 74 residences could not be determined and 720

residences declined participation. Therefore, a total of 1,119 residences participated in the study with 1,117 completed interviews, 1 partial interview, and 1 break-off interview.³² Six of the 1,117 completed interviews were excluded due to poor data quality, leaving a final sample of 1,111 youth and their parents (baseline response rate: 61%). Data from wave 2 through wave 5 were used for the current analyses because the NLE questions were not added until wave 2. Of the 1,111 participants, 32 (2.9%) were lost to follow-up by wave 2, leaving 1,079 participants for the current study. Of the 1,079 participants included in the current study, 99.4% completed wave 3, 98.0% completed wave 4, and 94.5% completed wave 5.

Computer assisted personal/self-interviewing (CAPI/CASI) procedures were used to collect data from youth and parents. One trained interviewer conducted the youth interview while a second trained interviewer conducted the parent interview at the same time in different rooms. Youth completed the risk behavior portion of the interview in a room without the interviewer to maximize privacy and honesty in responses. The institutional review board at the University of Oklahoma Health Sciences Center approved the YAS.

Measures

All measures were assessed at each wave used for the current study (waves 2-5).

Binge Drinking

Binge drinking was assessed by asking youth: “Over the past 6 months, on how many days did you drink 5 or more alcoholic drinks in a row”? Possible

responses included “never”, “once a month or less”, “2-3 days a month”, “1-2 days a week”, and “3-5 days a week”. Due to extremely low prevalence of binge drinking in the last 3 response categories, youth who reported any binge drinking during the previous 6 months were dichotomized as “yes”, while youth who did not report any binge drinking were dichotomized as “no”.

Negative Life Events

The YAS assessed 14 life events using a version of the life events scale³³⁻³⁵ that modified items to reflect events that are appropriate for adolescents.³⁶ Examples of measured life events include problems in school, experiencing conflict at home, and the death of a family member or close friend. Life events were assessed by telling youth: “Next I am going to read some things that may have happened to you in the past year. These things, or life events, may bring about changes in the lives of those who experience them. As I read them to you, first tell me if the life event happened to you during the past year, answer ‘yes’ or ‘no’; if you answer ‘yes’, please tell me whether it was a ‘good’ or ‘bad’ thing; and then tell me how much the event affected your life (‘no effect’, ‘some effect’, ‘moderate effect’, or a ‘great effect’). Negative life events only included events that: 1) youth experienced in the past year; 2) youth perceived as “bad”; and 3) youth reported had “some to great effect” on their life. One life event, getting married or begin living with someone, was excluded due to very low prevalence across all study waves. To assess the cumulative impact of NLEs, a NLE score was created by summing the total number of NLEs youth experienced ranging from 0-13. This score was then categorized as 0 NLEs, 1 NLE, 2 NLEs, or 3+

NLEs, since only about 5% of youth had 4 or more NLEs at each wave. This categorization is consistent with previous YAS research.¹⁵

Youth Assets

As shown in Table 1, the YAS measured seventeen youth assets across individual (seven assets), family (four assets), and community (six assets) domains using 61 items. Assets were measured using multiple items (2-4 items per asset) with established validity and reliability.³⁷ For each asset, the responses of multiple items were summed and divided by the total number of items to create a score ranging from 1 (almost never/strongly disagree/very low participation in positive event or behavior) to 4 (almost always/strongly agree/very high participation in positive event or behavior). Youth with a score of 3 or 4 for a given asset were coded as having that asset, while youth with a score of less than 3 were coded as not having that asset. Complete documentation of the asset items, response scales, scoring, and psychometric properties has been published elsewhere.³⁷

Cumulative asset scores within individual, family, and community domains were created for each youth by summing the number of assets the youth had within each respective domain. The range of cumulative scores for each domain was: individual assets (0-7), family assets (0-4), and community assets (0-6). Consistent with previous YAS literature,³⁸ an ordinal asset score was created for each asset domain with 0-2 assets set as the referent group.

Covariates

Demographic variables included youth-reported age, sex, race/ethnicity, family structure, and parent-reported income. Race/ethnicity categories included Hispanic, non-Hispanic black, non-Hispanic white, and other non-Hispanic race. Youth-reported family structure was categorized as living in a single-parent household, dual-parent household, or living on their own. Parent-reported annual income for the entire household was categorized as <35K, 35K-62K, and >62K.

Analyses

Generalized estimating equations (GEE) were used for all analyses. The GEE method is appropriate to use when analyzing correlated data obtained from repeated measures on the same individuals in a longitudinal study.³⁹ To investigate the compensatory effect of youth assets, hierarchical multiple GEE regression was used. In the first step, GEE models assessed the prospective influence of cumulative exposure to NLEs on binge drinking at the following wave of data collection. In the second step, the prospective influence of cumulative youth assets within individual, family, and community domains on binge drinking were evaluated. In the third step (primary objective 1), cumulative NLEs and assets in each domain were included in the same model to assess the compensatory effect of youth assets on binge drinking. To assess primary objective 2, interaction analyses were conducted to estimate multiplicative and additive interaction between NLEs and youth assets on binge drinking (buffering effect). To ease interpretation and allow for estimates of additive interaction, dichotomous NLE and asset variables were created by cutting NLE and asset scores in each domain at or above the median at each wave.⁴⁰ This approach is

also consistent with previous YAS research.⁴¹ For the multiplicative interaction models, a dichotomous NLE variable, dichotomous youth asset variable, and an NLE x asset interaction term were included. Additive interaction was assessed using relative excess risk due to interaction (RERI), which is a commonly used strategy when only risk ratios or odds ratios are available.⁴⁰ RERI assessed departure from additivity of effects using regression coefficients obtained from multiplicative interaction models for each asset domain using the following equation:⁴⁰

$$RERI_{OR} = OR_{High\ Asset+High\ NLE} - OR_{High\ Asset+Low\ NLE} - OR_{Low\ Asset+High\ NLE} + 1$$

A RERI estimate that is greater than 0 suggests positive additive interaction, while a RERI estimate below 0 suggests negative additive interaction.⁴⁰

In all analyses, NLEs and assets were treated as time-varying and lagged (i.e. NLEs and assets at wave 2 were used to predict binge drinking at wave 3, NLEs and assets at wave 3 were used to predict binge drinking at wave 4, etc.). All models adjusted for age, sex, and race/ethnicity. Parental income and family structure were included as covariates in all models and were treated as time-varying and lagged. Analyses were conducted in 2019 using SAS v9.4 (SAS Institute, Cary NC).

RESULTS

As shown in Table 2, at the beginning of the study period (wave 2), approximately half of the sample was female with a mean age of 15.3 years. Participants were racially and ethnically diverse: 39.3% non-Hispanic white, 27.7% Hispanic, 23.6% non-Hispanic black, and 9.4% other non-Hispanic race.

The prevalence of binge drinking in the past 6 months increased from 25.6% at wave 2 to 44.4% at wave 5.

The prevalence of individual and cumulative negative life events (NLEs) and youth assets (waves 2-4) are shown in Table 3. At baseline (wave 2), the most common NLEs were the death of a family member or close friend (37.9%), problems in school (21.4%), and conflict at home (18.5%). Overall, 71.3% of youth experienced at least one NLE and 18.2% experienced 3 or more. Cultural respect (94.9%), parental monitoring (86.0%), and non-parental adult role models (84.3%) were the most common assets at wave 2.

As shown in Table 4, youth who experienced NLEs had higher adjusted odds of binge drinking compared to youth who had 0 NLEs: 1 NLE [Adjusted Odds Ratio (AOR): 1.33, 95% Confidence Interval (CI): 1.13-1.58], 2 NLEs (AOR: 1.40, 95% CI: 1.15-1.71), or 3 NLEs (AOR: 1.72, 95% CI: 1.36-2.18). There also were graded protective relationships between youth assets and binge drinking within the individual, family, and community domains. When both NLEs and youth assets were included in the same model to determine whether youth assets had a compensatory effect on binge drinking, NLEs continued to significantly increase the binge drinking estimate over time. Individual and family assets continued to offer protection at higher levels of exposure and the community asset domain continued to have a graded association with binge drinking at all levels. For example, youth with 3 assets (AOR: 0.78, 95% CI: 0.65-0.93), 4 assets (AOR: 0.60, 95% CI: 0.49-0.73), 5 assets (AOR: 0.53, 95% CI: 0.41-0.69), or 6 assets (AOR: 0.42, 95% CI: 0.28-0.63) within the community

domain had significantly lower odds of binge drinking compared to youth with 0-2 community assets.

Table 5 shows the results of the models that examined interaction between NLEs and youth assets (buffering effect) within individual, family, and community domains (primary objective 2). No significant interactions were observed on the multiplicative or additive scales.

DISCUSSION

The purpose of this study was to understand how youth assets operate in the face of negative life events (NLEs) to influence binge drinking among youth. Specifically, we aimed to: 1) assess whether cumulative exposure to youth assets within individual, family, and community domains offer protection from binge drinking when NLEs are present (compensatory effect); and 2) test for interaction between cumulative exposure to individual, family, and community assets and NLEs on binge drinking on both the multiplicative and additive scales (buffering effect).

As anticipated, the prevalence of binge drinking increased over each wave of the study period as youth grew older. However, the number of NLEs and assets that youth experienced remained stable over time. While NLEs were prospectively associated with binge drinking, we also found evidence that youth assets within individual, family, and community domains can compensate for the negative impact of NLEs on binge drinking. When NLEs and youth assets were included in the same models, cumulative assets within each domain continued to protect youth from binge drinking. For example, at the community-level, having

three assets reduced the odds of binge drinking by 22%, four assets by 40%, five assets by 47%, and six assets by 58%. These findings suggest that despite exposure to NLEs, having a high number of assets across all domains can offer protection against binge drinking.

These results highlight the importance of implementing a positive youth development approach to building and strengthening youth assets rather than solely focusing on risk factors such as NLEs.⁴² Our findings are particularly important given how common NLEs were in this community-based sample of youth and that many NLEs, such as the death of a family member or close friend or experiencing a major change in family finances, are events that can be difficult to prevent. Our results add to a growing body of evidence that suggests that strengthening and building assets across multiple domains (individual, family, and community) may prevent binge drinking among youth.^{25,26} While it is important to help youth build skills and confidence at the individual level, promoting linkages with family, school, and community systems is also warranted.⁴³

Limitations

This study has several limitations. First, there is potential for response bias as binge drinking was self-reported. However, youth completed the risk behavior portion of the survey alone in a quiet room to minimize the potential for this bias.³² Second, the binge drinking outcome measure did not differentiate the intensity of binge drinking, did not differentiate between the number of drinks between males and females, and was measured using a single-item. Future

studies with a larger sample size could explore how NLEs and assets affect different patterns of binge drinking. Third, the most prevalent NLE, “death of a family member or close friend”, did not specify the whether this refers to a first degree family member and did not differentiate whether the death was a family member or close friend. Fourth, while our study assessed the impact of cumulative NLEs and youth assets on binge drinking, it is important to note that we did not examine what combinations of NLEs or assets are most harmful or protective against binge drinking. Furthermore, we estimated the overall impact of NLEs and assets on binge drinking across the entire study period while adjusting for age, but the influence of NLEs and assets may be more important at different stages of adolescence. Future research using growth curve models could assess how these relationships may change over time. Fifth, while we controlled for a range of time varying sociodemographic variables, there may be other unknown or unmeasured confounders that influence the relationship between NLE, youth assets, and binge drinking. Finally, the study response rate was 61% and therefore selection bias may have been introduced if youth who did not participate in the study had fewer assets and more NLEs than youth who did participate.

Conclusions

The findings of this study suggest that while youth who are exposed to NLEs are at risk for binge drinking, providing youth with opportunities to build assets can have a strong protective influence. These results support using an

ecological approach to studying how assets may benefit youth across multiple domains of influence.

Table 1. Individual, family, and community youth assets, Youth Asset Study (YAS)

Assets	Number of Items	Sample Item
Individual Assets		
General Aspirations for the Future	3	What are the chances that when you are an adult you will be successful in whatever you choose to do?
Cultural Respect	4	You trust people from other racial/ethnic cultures.
Educational Aspirations for the Future	2	As you look to the future, how important is it that you stay in school?
Good Health Practices	4	You take care of your body by exercising.
General Self-Confidence	4	I can generally handle whatever comes my way.
Responsible Choices	3	You can say no to activities you think are wrong.
Religiosity	4	How important is it to you to be able to rely on religious teachings when you have a problem?
Family Assets		
Relationship with Mother	4	You are satisfied with the way your mother and you communicate with each other.
Relationship with Father	4	Most of the time, your father is warm and loving toward you.
Family Communication	4	How often do you talk to your parents about what is right and wrong?
Parental Monitoring	4	My parents know where I am after school.
Community Assets		
Non-Parent Adult Role Models	3	You know adults who encourage you often.
Community Involvement	4	You work to make your community a better place.
Use of Time (Religion)	2	On average, how often did you attend religious services during the past 12 months?
Use of Time (Groups/Sports)	4	You participate in out-of-school sports teams or groups.
School Connectedness	4	You feel close to people at your school.
Positive Peer Role Models	4	Do most of your friends follow the rules their parents make for them?

Table 2. Demographic characteristics and binge drinking of participants in the Youth Asset Study (N=1,079)

	Total N (%)
Demographic Characteristics (Wave 2)	
Sex	
Male	564 (52.3)
Female	515 (47.7)
Age	
13	161 (14.9)
14	230 (21.3)
15	227 (21.0)
16	181 (16.8)
17	152 (14.1)
18+	128 (11.9)
Race/Ethnicity	
Hispanic	306 (27.7)
Non-Hispanic black	261 (23.6)
Non-Hispanic white	434 (39.3)
Other non-Hispanic race	104 (9.4)
Parental Income	
< 35 K	543 (49.5)
35K – 62K	330 (30.1)
> 62K	225 (20.5)
Family Structure^a	
1 parent	773 (69.6)
2 parents	338 (30.4)
Binge Drinking (Wave 2)	
Yes	273 (25.6)
No	795 (74.4)
Binge Drinking (Wave 3)	
Yes	353 (33.2)
No	712 (66.8)
Binge Drinking (Wave 4)	
Yes	420 (40.2)
No	626 (59.8)
Binge Drinking (Wave 5)	
Yes	461 (44.4)
No	577 (55.6)

^a No youth reported living alone at wave 2

Table 3. Prevalence of negative life events (NLEs) and youth assets, Youth Asset Study (N=1,079)

	Wave 2	Wave 3	Wave 4
	Total N (%)	Total N (%)	Total N (%)
Individual NLEs			
Major Personal Injury	140 (13.0)	143 (13.3)	145 (13.7)
Change of School	39 (3.6)	24 (2.2)	14 (1.3)
Problem in School	231 (21.4)	182 (17.0)	127 (12.0)
Change of Residence (same city)	22 (2.0)	21 (2.0)	19 (1.8)
Move to New City	12 (1.1)	13 (1.2)	17 (1.8)
Made New Friends	14 (1.3)	7 (0.7)	7 (0.7)
Parent Separation or Divorce	28 (2.6)	35 (3.3)	23 (2.2)
Break-Up w/ Significant Other	167 (15.5)	161 (15.0)	146 (13.8)
Major Change Family Finances	161 (15.0)	154 (14.4)	134 (12.7)
Parent got New Spouse/Partner	23 (2.1)	27 (2.5)	24 (2.3)
Conflict at Home	200 (18.5)	192 (17.9)	182 (17.3)
Death of Family Member or Close Friend	408 (37.9)	378 (35.3)	408 (38.7)
Other Life Events	54 (5.0)	33 (3.1)	33 (3.1)
Cumulative NLEs			
0	310 (28.7)	347 (32.4)	353 (33.4)
1	352 (32.6)	338 (31.5)	336 (31.8)
2	221 (20.5)	232 (21.6)	224 (21.2)
3+	196 (18.2)	155 (14.5)	143 (13.5)
<i>Median</i>	1	1	1
Individual Assets			
General Aspirations for the Future	971 (90.0)	996 (92.9)	995 (94.2)
Cultural Respect	1024 (94.9)	1038 (96.8)	1004 (95.1)
Educational Aspirations for the Future	1005 (93.1)	980 (91.4)	916 (86.7)
Good Health Practices	649 (60.2)	644 (60.0)	573 (54.3)
General Self-Confidence	878 (81.4)	897 (83.7)	885 (83.8)
Responsible Choices	936 (86.8)	939 (87.6)	937 (88.7)
Religiosity	893 (82.8)	874 (81.5)	850 (80.5)
<i>Individual Cumulative Assets - Median</i>	6	6	6
Family Assets			
Relationship with Mother	865 (80.8)	867 (81.3)	863 (82.4)
Relationship with Father	644 (66.0)	620 (63.1)	614 (64.0)
Family Communication	580 (53.8)	621 (57.9)	68 (64.6)
Parental Monitoring	904 (86.0)	833 (82.2)	724 (77.9)
<i>Family Cumulative Assets - Median</i>	3	3	3

Community Assets

Non-Parent Adult Role Models	910 (84.3)	918 (85.6)	910 (86.2)
Community Involvement	184 (17.1)	187 (17.4)	183 (17.3)
Use of Time (Religion)	522 (48.4)	468 (43.7)	378 (35.8)
Use of Time (Groups/Sports)	329 (30.8)	336 (31.3)	275 (26.1)
School Connectedness	758 (70.8)	780 (72.8)	764 (72.4)
Positive Peer Role Models	587 (54.4)	606 (56.6)	581 (55.0)
<i>Community Cumulative Assets - Median</i>	3	3	3

Table 4. Prospective influence of negative life events (NLEs) and youth assets on binge drinking, Youth Asset Study (N=1,079)

	Step 1 ^a AOR (95% CI)	Step 2 ^a AOR (95% CI)	Step 3 ^a AOR (95% CI)
Cumulative NLEs			
0	Ref	---	Ref
1	1.33 (1.13-1.58)	---	1.32 (1.12-1.57)
2	1.40 (1.15-1.71)	---	1.38 (1.13-1.69)
3+	1.72 (1.36-2.18)	---	1.69 (1.33-2.14)
Cumulative Individual Assets			
0-2	---	Ref	Ref
3	---	0.70 (0.41-1.20)	0.66 (0.34-1.26)
4	---	0.73 (0.45-1.20)	0.75 (0.41-1.36)
5	---	0.62 (0.39-0.96)	0.66 (0.38-1.14)
6	---	0.58 (0.37-0.91)	0.62 (0.36-1.07)
7	---	0.45 (0.29-0.72)	0.48 (0.28-0.83)
Cumulative NLEs			
0	Ref	---	Ref
1	1.33 (1.13-1.58)	---	1.32 (1.11-1.56)
2	1.40 (1.15-1.71)	---	1.35 (1.11-1.65)
3+	1.72 (1.36-2.18)	---	1.65 (1.30-2.09)
Cumulative Family Assets			
0-2	---	Ref	Ref
3	---	0.84 (0.72-0.99)	0.87 (0.72-1.04)
4	---	0.65 (0.54-0.78)	0.62 (0.50-0.77)
Cumulative NLEs			
0	Ref	---	Ref
1	1.33 (1.13-1.58)	---	1.32 (1.11-1.57)
2	1.40 (1.15-1.71)	---	1.35 (1.10-1.65)
3+	1.72 (1.36-2.18)	---	1.63 (1.28-2.07)
Cumulative Community Assets			
0-2	---	Ref	Ref
3	---	0.80 (0.69-0.94)	0.78 (0.65-0.93)
4	---	0.66 (0.55-0.78)	0.60 (0.49-0.73)
5	---	0.60 (0.48-0.74)	0.53 (0.41-0.69)
6	---	0.54 (0.38-0.76)	0.42 (0.28-0.63)

Note. Generalized estimating equations (GEE).

'AOR' = adjusted odds ratio; 'CI' = confidence interval.

^a Adjusted for sex (baseline), age (baseline), race/ethnicity (baseline), parental income (time-varying), and family structure (time-varying).

Table 5. Interaction between negative life events (NLEs) and youth assets on binge drinking, Youth Asset Study (N=1,079)

	Multiplicative Interaction^a	Additive Interaction^{a,b}
	AOR (95% CI)	RERI (95% CI)
Individual Assets		
Low NLE, Low Asset	1 (reference)	
High NLE, Low Asset	1.45 (1.10-1.92)	
Low NLE, High Asset	0.82 (0.61-1.11)	
High NLE, High Asset	1.14 (0.87-1.49)	-0.13 (-1.12, 0.86)
Family Assets		
Low NLE, Low Asset	1 (reference)	
High NLE, Low Asset	1.28 (0.98-1.68)	
Low NLE, High Asset	0.78 (0.65-0.95)	
High NLE, High Asset	1.01 (0.77-1.31)	-0.05 (-0.88, 0.78)
Community Assets		
Low NLE, Low Asset	1 (reference)	
High NLE, Low Asset	1.28 (1.06-1.54)	
Low NLE, High Asset	0.54 (0.42-0.70)	
High NLE, High Asset	0.87 (0.69-1.10)	0.05 (-0.70, 0.80)

Note. Generalized estimating equations (GEE).

'AOR' = adjusted odds ratio; 'CI' = confidence interval; 'RERI' = relative excess risk due to interaction.

^a Adjusted for sex (baseline), age (baseline), race/ethnicity (baseline), parental income (time-varying), and family structure (time-varying).

^b A RERI estimate greater than 0 suggests positive additive interaction, while a RERI estimate below 0 suggests negative additive interaction.

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Chapter 3

Does family communication and school connectedness buffer the association between adverse childhood experiences (ACEs) and suicidal behaviors in adolescents? Findings from representative samples of middle school and high school students

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Prepared for submission to the *American Journal of Public Health*.

Funding: This study was supported by CDC-PS13-1308, funded by the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention or the Department of Health and Human Services. Supplemental funding was also provided by the Nevada Division of Public and Behavioral Health.

ABSTRACT

Objectives: To determine whether family communication and school connectedness offer protection against suicidal behaviors in the presence of adverse childhood experiences (ACEs) (direct protective effect); and 2) whether family communication or school connectedness buffer the association between ACEs and suicidal behaviors (interacting protective effect) on the multiplicative and additive scales.

Methods: Data were obtained from a western state's 2019 Youth Risk Behavior Survey that included 5,341 middle school and 4,980 high school participants. Generalized linear models were used to estimate whether family communication and school connectedness offered direct protection against suicidal behaviors or buffered the association between ACEs and suicidal behaviors using adjusted prevalence ratios (APRs).

Results: Family communication and school connectedness offered direct protection against suicidal behaviors in the presence of ACEs (APRs for one-unit increase ranged from 0.88 to 0.92 for middle school youth and 0.87 to 0.93 for high school youth). There was evidence that family communication and school connectedness buffered the association between ACEs and suicidal behaviors on both additive and multiplicative scales.

Conclusions: Interventions that build family communication and school connectedness are warranted.

INTRODUCTION

In 2018, suicide was the second leading cause of death among 10-24 years old in the United States, trailing only unintentional injuries.¹ Suicide is typically preceded by nonfatal thoughts and behaviors, including suicide ideation, planning, and attempts,² which are collectively referred to as “suicidal behaviors” and are the strongest risk factors for suicide.² According to 2017 national estimates, 17.2% of high school students seriously considered attempting suicide, 13.6% made a plan about how they would attempt suicide, and 7.4% attempted suicide in the previous 12 months.³ Epidemiologic data suggest that the onset of suicidal behaviors begins and increases during adolescence, before leveling off in young adulthood.^{4,5} There is also evidence that more than half of youth aged 13-18 who develop a suicide plan go on to attempt suicide, and that this transition typically happens within a year.⁴ Therefore, understanding factors associated with a range of suicidal behaviors during early and late adolescence and developing early interventions is crucial.

Well established risk factors for adolescent suicidal behaviors include depression,^{2,6,7} substance use,^{2,6-8} and bullying victimization.⁹ Additionally, there is increasing evidence that exposure to adversity during childhood may contribute to the development of suicide behaviors among youth. Adverse childhood experiences (ACEs) are stressful and traumatic events that occur during childhood such as abuse, neglect, and various forms of household dysfunction.¹⁰ Evidence from large, cross-sectional studies of middle school and high school youth^{11,12} and a community-based prospective study of 10-18 years

olds¹³ suggests that there is a strong and graded association between cumulative ACE exposure and suicidal behaviors. However, some adolescents with chronic exposure to ACEs are resilient and do not engage in suicidal risk taking. To guide suicide prevention efforts, it is important to identify areas of strength that can minimize the impact of ACEs and help protect youth from engaging in suicidal behaviors.

Numerous studies have shown that family communication and school connectedness play an important role in youth development and health promotion.¹⁴ Family communication, which includes positive, respectful, and open dialogue among family members, is associated with a reduction in a wide range of risk factors and promotes well-being for youth.¹⁵ More specifically, population-based studies provide evidence that family communication can offer protection against suicide ideation¹⁶ and suicide attempts among youth.¹⁷ Similarly, school connectedness, or a youths' relationship with their school, including interpersonal relationships with teachers and peers and attitudes toward school importance, can also positively influence health.¹⁸ A recent meta-analysis that combined data from more than 50,000 youth showed that high levels of school connectedness reduced the odds of suicide ideation by 47% and suicide attempt by 41%.¹⁹ Despite the protective influence of family communication and school connectedness on suicidal behaviors, studies that examine whether these protective factors can mitigate or buffer the influence of ACEs on suicidal behaviors are lacking.

Objectives

Using representative samples of 5,341 middle school and 4,980 high school youth, we aimed to determine: 1) whether family communication and school connectedness offer protection against suicidal behaviors in the presence of ACEs (direct protective effect); and 2) whether family communication and school connectedness buffer the association between ACEs and suicidal behaviors (interacting protective effect) on the multiplicative and additive scales.

METHODS

Participants and Procedures

The Youth Risk Behavior Survey (YRBS) is a national, school-based surveillance system established by the Centers for Disease Control and Prevention (CDC) in 1991 to monitor the prevalence of risk behaviors among high school youth. A small number of states also choose to conduct the YRBS in middle schools.²⁰ Data for the current study were obtained from a 2019 middle school and high school YRBS conducted in a western state. A strata (region)/cluster (classroom) sampling design was used to randomly sample classrooms from grades 6-8 (middle school YRBS) and grades 9-12 (high school YRBS) in all regular public, charter, and alternative secondary schools throughout the state. The middle school and high school samples were drawn separately, with unique sampling weights generated for each group. First, the state's 17 school district were grouped into 8 regions that align with the state's prevention coalition structure. Next, a random sample of 2nd period or required English classrooms were selected for participation from all middle schools and high schools throughout the state.

Passive parental consent (10 out of 17 school districts) or active parental consent (7 out of 17 school districts) was obtained prior to survey administration, depending on school district policy. Once parent consent was obtained, the questionnaire was administered to all eligible youth in randomly sampled classrooms. Students could decline participation or skip any questions they felt uncomfortable answering. 5,341 middle school youth from 113 schools completed the 2019 middle school survey, with a school response rate of 95.0%, a student response rate of 70.4%, and a combined response rate of 67.2%. 4,980 high school youth from 98 high schools completed the 2019 high school survey, with a school response rate of 98.0%, student response rate of 68.6%, and a combined response rate of 67.3%.

Measures

Outcome Variables

The questions related to suicidal behaviors are standard questions from CDC's YRBS core survey and have been assessed since 1991.²¹ The items were prefaced with an explanation that people sometimes feel so depressed about the future that they may consider attempting suicide or killing themselves. Students then self-reported suicide ideation ("yes" vs. "no"), plan ("yes" vs. "no"), and attempt ["yes" vs. "no" (middle school); "0 times" vs. "1 or more times" (high school)] in the past 12 months.

Exposure Variables

Adverse Childhood Experiences (ACEs). In addition to sexual abuse (CDC core YRBS variable), five state-added ACE measures were included:^{11,22} 1)

witnessing domestic violence – “Have you ever seen or heard adults in your home slap, hit, kick, punch, or beat each other up?”; 2) physical abuse – “Have you ever been hit, beaten, kicked, or physically hurt in any way by an adult? (Do not count being spanked for bad behavior)”; 3) verbal abuse – “How often has an adult in your home ever sworn at you, insulted you, or put you down?”; 4) living with someone who had a mental health problem – “Have you ever lived with someone who was depressed, mentally ill, or suicidal?”; and 5) living with someone who abused alcohol or other substances – “Have you ever lived with someone who was a problem drinker or alcoholic or abused street or prescription drugs?”

Responses were dichotomized as “yes” versus “no” for all items, except verbal abuse which was coded as “yes” if it occurred sometimes, most of the time, or always. The six ACE questions were summed to create a score ranging from 0-6. The complete BRFSS ACE module measures 8 ACEs and is usually categorized as 0, 1, 2, 3, and 4+ ACEs;²³ we used 3+ ACEs as the high exposure category because we only measured 6 ACEs.^{11,24} For the interaction analyses, the ACE score was dichotomized high ACE exposure (3+ ACEs) or low to moderate ACE exposure (0-2 ACEs).

Family communication. Family communication was measured using three items adapted from the Youth Asset Survey (YAS)²⁵: 1) “How often do you talk to your parents or other adults in your home about your problems?”; 2) “How often do you talk to your parents about what is right and wrong?”; and 3) “How often do you feel comfortable talking to your parents about personal matters?” Possible

responses for all items were: never (1), rarely (2), sometimes (3), most of the time (4), and always (5). These response categories differed from those on the YAS survey in order to be consistent with other self-report items on the YRBS. The reliability of the items was similar in the middle school (Cronbach's $\alpha = 0.79$) and high school samples (Cronbach's $\alpha = 0.81$). For youth who answered at least two out of the three items, responses were summed to create a family communication score, with higher scores reflecting higher family communication (range = 2-15). The mean score was 8.3 and the median score was 8.0 for both high school and middle school youth. For interaction analyses, high family communication was defined as scores at or above the median.

School connectedness. School connectedness was measured using three items adapted from the Youth Asset Survey (YAS)²⁵: 1) "How often do you feel close to people at your school?"; 2) "How often are you happy to be at your school?"; and 3) "How often do the teachers at your school treat students fairly"? Possible responses for all items were: never (1), rarely (2), sometimes (3), most of the time (4), and always (5). The reliability of the items were slightly lower in the middle school sample (Cronbach's $\alpha = 0.55$) compared to the high school sample (Cronbach's $\alpha = 0.64$). For youth who answered at least two out of the three items, responses to the items were summed to create a school connectedness score, with higher scores reflecting higher school connectedness (range = 2-15). The mean and median score was 10.0 for middle school youth while the mean was 9.5 and the median was 10.0 for high school youth. For

interaction analyses, high school connectedness score was defined as scores at or above the median.

Covariates

Demographic covariates include self-reported sex (male vs. female), race/ethnicity (Hispanic, non-Hispanic white, non-Hispanic black, or non-Hispanic other) grade level (6, 7, 8 or 9, 10, 11, 12), rurality (urban: $\geq 50,000$ persons vs. rural $< 50,000$ persons),²⁶ and self-reported qualification for free and reduced price lunches (yes vs. no). Students also self-reported whether they had a parent or other adult family member in the home serving on active duty in the military (“yes” vs. “no”) and high school students their own sexual identity using the standardized YRBS question;²⁰ responses included “heterosexual (straight)”, “gay or lesbian”, “bisexual”, or “not sure”.

Analyses

Generalized estimating equations (GEE) models were used to estimate adjusted prevalence ratios (APR) and corresponding 95% confidence intervals (95% CI) while accounting for regional- and classroom-level clustering. To explore the direct influence of family communication and school connectedness scores, we used a series of models for each suicidal behavior. Model 1 included cumulative ACE exposure only, model 2 included each protective factor score alone (family communication or school connectedness), and model 3 included both ACE exposure and each protective factor score separately.

Next, interaction analyses were conducted to assess the buffering effect of high family communication and high school connectedness on the relationship

between high ACE exposure and suicidal behaviors on the multiplicative (ratio) and additive (difference) scales.²⁷ The lowest risk group (youth with high family communication/school connectedness and low ACEs) were chosen as the reference group for all multiplicative and additive interaction models, as this is the recommended practice for presenting additive interaction analyses.²⁸

The fully adjusted multiplicative models included high ace exposure, the protective factor (high family communication or high school connectedness) and an interaction term (high ACE exposure x high family communication or high ACE exposure x high school connectedness). Relative Excess Risk due to Interaction (RERI) was used to translate multiplicative interaction measures to the additive scale and 95% confidence intervals were calculated using the delta method, with the prevalence ratio estimating the risk ratio.^{27,29} This method is commonly used to estimate interaction on the additive scale when risks cannot be directly calculated. An estimate greater than zero signifies positive interaction and an estimate less than zero signifies negative interaction.²⁷

All models adjusted for sex, race/ethnicity, grade, rurality, qualification for free and reduced price lunches, parental permission status (active vs. passive), family military involvement, and sexual identity (high school only).^{11,24} Due to the different weights for the middle school and high school samples, analyses were stratified by school type (middle school vs. high school). For both samples, data were weighted based on sex, grade, and race/ethnicity among youth within each of the eight regions and accounted for clustering at regional and classroom levels.

RESULTS

Table 1 shows the characteristics of middle school and high school participants. Just over half of both samples were male, the most common racial/ethnic group was Hispanic (45% middle school and 43% high school) followed by non-Hispanic white (30% middle school and 32% high school). Most students lived in urban settings, about 42% qualified for free or reduced lunch, and 8% of middle school students and 5% of high school students lived in a military household. About 15% of middle school youth and 21% of high school youth self-reported 3 or more ACEs. Middle school and high school youth had similar family communication and school connectedness scores. About 22% of middle school and 18% of high school youth reported suicide ideation, 13% of middle school and 15% of high school youth reported suicide plan, and 8% of middle school and 9% of high school youth reported suicide attempt in the past 12 months,

Table 2 shows the results of the fully adjusted, hierarchical models. For both middle school and high school youth, cumulative ACE exposure had a strong, graded relationship with all suicidal behaviors with the adjusted prevalence ratios (APRs) for youth with 3 or more ACEs compared to those with 0 ACEs ranging from 5.50 to 8.03 for middle school youth and 3.63 to 4.35 for high school youth. Conversely, a one-unit increase in family communication score decreased the prevalence of suicidal behaviors 11-15% for middle school youth and 10-15% for high school youth. Similarly, a one-unit increase in school connectedness score reduced the prevalence of suicidal behaviors 12-16% for

middle school youth and 10-15% for high school youth. When both cumulative ACE exposure and each protective factor were included in the models, a one-unit increase in family communication and school connectedness scores continued to be associated with a lower prevalence of suicidal behaviors.

Further, while ACEs remained associated with suicidal behaviors, there was some attenuation when protective factors were included in the models, especially among youth with 3 or more ACEs. For example, when family communication was included in the models, APRs for those with 3 or more ACEs ranged from 4.01 to 5.86 for middle school youth and 2.82 to 3.63 for high school youth. When school connectedness was included in the models, APRs for youth with 3 or more ACEs ranged from 4.82 to 6.82 for middle school youth and 2.98 to 3.93 for high school youth.

Table 3 shows the results of the multiplicative and additive interaction models for middle school youth. On the multiplicative scale, high family communication significantly buffered (negative interaction) the relationship between high ACE exposure and suicide ideation ($p < .001$), suicide plan ($p = .002$), and suicide attempt ($p = .015$). There was also evidence of significant negative interaction of school connectedness on the relationship between high ACE exposure and suicide ideation ($p = .004$), but not suicide plan ($p = .356$), or suicide attempt ($p = .227$). There was no consistent evidence of interaction on the additive scale.

Table 4 shows the results of the multiplicative and additive interaction models for high school youth. On the multiplicative scale, high family

communication significantly buffered (negative interaction) the relationship between high ACE exposure and suicide ideation ($p = .041$) and suicide plan ($p = .012$), but not suicide attempt ($p = .260$). Further, there was significant negative interaction between high school connectedness and high ACE exposure for suicide ideation ($p = .002$) and nearly significant interaction for suicide plan ($p = .055$), but not for suicide attempt ($p = .360$). There was no consistent evidence of interaction on the additive scale.

DISCUSSION

The main objectives of this study were to determine: 1) whether family communication and school connectedness offer protection against suicidal behaviors in the presence of ACEs (direct protective effect); and 2) whether family communication and school connectedness buffer the association between ACEs and suicidal behaviors (interacting protective effect). Our findings suggest that both family communication and school connectedness had a strong direct protective effect on suicidal behaviors, as they both continued to offer protection against all suicidal behaviors in the presence of ACEs for middle school and high school youth. Further, the presence of family communication and school connectedness attenuated the association between ACEs on suicidal behaviors, particularly at the highest level of ACE exposure. The results of the interaction analyses provide evidence that family communication and school connectedness also buffered the relationship between ACEs and suicidal behaviors on the multiplicative scale, and while generally not significant, there was evidence of

negative interaction on the additive scale as nearly all RERI estimates were less than zero.

While previous studies have shown that family communication and school connectedness protect youth from suicidal behaviors,¹⁶⁻¹⁸ our study represents an important contribution by further demonstrating that these protective factors can actually modify the influence of ACEs on suicide ideation, planning, and attempts. These findings support other research investigating the buffering effect of other protective factors such as social support.³⁰ Future research using longitudinal designs should explore whether a wider range of protective factors across individual, family, and community domains of behavioral influence can minimize the impact of ACEs on suicidal behaviors.

An unanticipated finding in our study was that associations between cumulative ACE exposure and suicidal behaviors were consistently stronger for middle school youth than for high school youth; however, the buffering influence of family communication and school connectedness was also greater during early adolescence. Although our study design did not allow an investigation of the temporal sequencing of adverse events and suicidal behaviors, a recent prospective study found that adversities occurring during early adolescence (13-14 years) had a stronger impact on a range of poor health outcomes than those occurring during earlier years (7-12 years).³¹ There is a need for more longitudinal studies using growth curve analyses to better understand whether ACEs and different forms of strength and resilience have a stronger impact during different developmental periods across the lifespan.

Strengths and Limitations

Our study utilized a large, representative sample of middle school and high school youth. The inclusion of middle school youth is critical, as suicidal behaviors often develop early in adolescence. We were also able to address a critical gap in the literature by exploring whether family communication and school connectedness can modify the relationship between ACEs and suicidal behaviors on both the multiplicative and interactive scales. However, several important limitations should be acknowledged.

First, this study was cross sectional and therefore, we cannot infer temporality between ACEs, protective factors, and suicidal behaviors. Second, there is potential for social desirability of responses given the sensitive nature of some of the survey questions. However, youth recorded their responses to survey items on a de-identified form that was not connected to the survey instrument and no identifying information was collected. Third, there is potential for dependent error as youth who are willing to report sensitive adverse childhood experiences, such as abuse and household dysfunction, may also be more willing to report engagement in suicidal behaviors. Fourth, our survey only assessed six abuse and household dysfunction ACEs, and we did not have information on neglect, exposure to community violence, and other important forms of adversity. Additionally, the survey only assessed two external assets: family communication and school connectedness. These assets were both measured using multi-item constructs that were adapted from the valid and reliable measures from the Youth Asset Study (YAS), however the reliability

coefficients for the school connectedness items were low in this sample (Cronbach's $\alpha = 0.55$ for middle school youth and Cronbach's $\alpha = 0.64$ for high school youth).

Public Health Implications

Strength-based approaches to suicide prevention that focus on building family communication and school connectedness are warranted. For example, a large randomized controlled trial demonstrated that a school-based intervention designed to help youth deal with stress, adverse life events, and suicidal thoughts by improving coping skills improved school connectedness and reduced severe suicide ideation and incident suicide attempt at 12-month follow-up.^{32,33} Such interventions may be most impactful when implemented at an early age as we found the ACEs had a stronger association with suicidal behaviors among middle school youth, but the buffering influences of family communication and school connectedness were also stronger. A probable challenge is that programs intended to improve family communication will include parents and may address issues related to parenting styles and parent/child dynamics. Practitioners will need to be resourceful and tactful in order to effectively address the logistical issues related to delivery of a program to parents and their children with activities and topics that can be sensitive.

While family communication and school connectedness buffered the relationship between ACEs and suicidal behaviors, they did not fully eliminate the negative influence of ACEs. This highlights the need for trauma-informed interventions for suicide prevention. Finally, the high prevalence of ACEs and

suicidal behaviors among middle school and high school youth support the development of primary screening and risk assessment efforts to provide youth with appropriate referrals and services.

Table 1. Characteristics of middle school and high school participants – 2019 Middle School Youth Risk Behavior Survey (N=5,341) and 2019 High School Youth Risk Behavior Survey (N=4,980)

	Middle School N (Weighted %)	High School N (Weighted %)
<u>Sociodemographics</u>		
Sex		
Female	2825 (48.7)	2607 (48.9)
Male	2478 (51.3)	2341 (51.1)
Race/ethnicity		
Hispanic	2208 (44.9)	1986 (42.9)
Non-Hispanic black	254 (11.5)	238 (10.3)
Non-Hispanic other	779 (14.1)	727 (14.7)
Non-Hispanic white	1890 (29.5)	1904 (32.0)
Grade		
6 th grade	1460 (30.9)	---
7 th grade	2116 (34.7)	---
8 th grade	1712 (34.4)	---
9 th grade	---	1317 (26.0)
10 th grade	---	1341 (25.9)
11 th grade	---	1263 (25.0)
12 th grade	---	1019 (23.1)
Location of residence		
Rural	1716 (8.6)	1692 (9.3)
Urban	3625 (91.4)	3288 (90.7)
Free or reduced lunch		
Yes	2014 (42.6)	1832 (42.2)
No	3279 (57.4)	3087 (57.8)
Military Family Status		
Yes	414 (7.9)	245 (4.9)
No	4818 (92.1)	4682 (95.1)
Sexual identity		
Lesbian, gay, bisexual	---	677 (14.2)
Not sure	---	225 (4.5)
Heterosexual	---	3886 (81.3)
<u>Adverse childhood experiences (ACEs)</u>		
ACE score		
0 ACEs	2349 (44.4)	1765 (35.9)
1 ACE	1261 (24.8)	1233 (26.1)
2 ACEs	813 (15.9)	858 (17.2)
3+ ACEs	889 (14.9)	1083 (20.8)

Protective Factors**Family Communication**

Mean (SD)	8.3 (3.5)	8.3 (3.3)
Median	8.0	8.0

School Connectedness

Mean (SD)	10.0 (2.6)	9.5 (2.6)
Median	10.0	10.0

Suicidal behaviors (past 12-months)**Suicide ideation**

Yes	1092 (21.8)	931 (18.0)
No	4110 (78.2)	3950 (82.0)

Suicide plan

Yes	636 (12.9)	768 (15.3)
No	4593 (87.1)	4108 (84.7)

Suicide attempt

Yes	401 (8.1)	418 (8.9)
No	4789 (91.9)	3849 (91.1)

Table 2. Adjusted prevalence ratios of suicidal behaviors – 2019 Middle School Youth Risk Behavior Survey (N=5,341) and 2019 High School Youth Risk Behavior Survey (N=4,980)

	Suicide Ideation (past 12-months)		Suicide Plan (past 12-months)		Suicide Attempt (past 12-months)		
	Middle School	High School	Middle School	High School	Middle School	High School	
	APR (95% CI)	APR (95% CI)	APR (95% CI)	APR (95% CI)	APR (95% CI)	APR (95% CI)	
1. ACE score							
0 ACEs	Ref	Ref	Ref	Ref	Ref	Ref	
1 ACE	2.49 (2.01, 3.09)	1.90 (1.40, 2.59)	2.23 (1.63, 3.05)	1.69 (1.23, 2.34)	1.45 (0.93, 2.28)	1.25 (0.83, 1.91)	
2 ACEs	3.39 (2.72, 4.23)	2.74 (2.02, 3.71)	4.03 (2.95, 5.50)	2.28 (1.64, 3.18)	3.58 (2.41, 5.32)	1.98 (1.34, 2.91)	
3+ ACEs	5.50 (4.47, 6.78)	4.35 (3.31, 5.71)	6.48 (5.01, 8.39)	4.19 (3.16, 5.56)	8.03 (5.66, 11.37)	3.63 (2.51, 5.25)	
Family Communication	2. Family communication score	0.85 (0.83, 0.87)	0.89 (0.87, 0.91)	0.85 (0.82, 0.88)	0.86 (0.84, 0.89)	0.84 (0.80, 0.88)	0.88 (0.83, 0.92)
	3. ACE score + family communication score						
	ACE Score						
	0 ACEs	Ref	Ref	Ref	Ref	Ref	Ref
	1 ACE	2.11 (1.69, 2.63)	1.69 (1.23, 2.32)	1.90 (1.38, 2.63)	1.48 (1.06, 2.06)	1.21 (0.75, 1.93)	1.13 (0.75, 1.70)
	2 ACEs	2.64 (2.10, 3.32)	2.47 (1.81, 3.39)	3.16 (2.29, 4.36)	1.99 (1.41, 2.82)	2.75 (1.80, 4.21)	1.71 (1.15, 2.54)
	3+ ACEs	4.01 (3.19, 5.06)	3.63 (2.73, 4.82)	4.78 (3.57, 6.40)	3.30 (2.46, 4.44)	5.86 (3.94, 8.70)	2.82 (1.91, 4.16)
	Family communication	0.89 (0.87, 0.92)	0.92 (0.90, 0.94)	0.90 (0.87, 0.93)	0.89 (0.87, 0.92)	0.90 (0.85, 0.94)	0.90 (0.86, 0.96)

1. ACE score								
0 ACEs	Ref	Ref	Ref	Ref	Ref	Ref	Ref	
1 ACE	2.49 (2.01, 3.09)	1.90 (1.40, 2.59)	2.23 (1.63, 3.05)	1.69 (1.23, 2.34)	1.45 (0.93, 2.28)	1.25 (0.83, 1.91)		
2 ACEs	3.39 (2.72, 4.23)	2.74 (2.02, 3.71)	4.03 (2.95, 5.50)	2.28 (1.64, 3.18)	3.58 (2.41, 5.32)	1.98 (1.34, 2.91)		
3+ ACEs	5.50 (4.47, 6.78)	4.35 (3.31, 5.71)	6.48 (5.01, 8.39)	4.19 (3.16, 5.56)	8.03 (5.66, 11.37)	3.63 (2.51, 5.25)		
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School Connectedness	2. School connectedness score	0.88 (0.86, 0.91)	0.89 (0.87, 0.92)	0.84 (0.81, 0.88)	0.90 (0.87, 0.93)	0.84 (0.80, 0.87)	0.85 (0.81, 0.88)	
	<hr/>							
	3. ACE score + school connectedness score							
ACE Score								
0 ACEs	Ref	Ref	Ref	Ref	Ref	Ref	Ref	
1 ACE	2.32 (1.86, 2.89)	1.75 (1.27, 2.40)	2.03 (1.48, 2.78)	1.59 (1.14, 2.22)	1.30 (0.82, 2.05)	1.15 (0.75, 1.75)		
2 ACEs	3.09 (2.48, 3.86)	2.50 (1.82, 3.42)	3.52 (2.59, 4.78)	2.13 (1.51, 2.99)	3.07 (2.06, 4.57)	1.63 (1.09, 2.45)		
3+ ACEs	4.82 (3.90, 5.97)	3.93 (2.98, 5.20)	5.38 (4.14, 6.98)	3.85 (2.91, 5.11)	6.62 (4.68, 9.40)	2.98 (2.06, 4.31)		
School connectedness score	0.92 (0.89, 0.95)	0.92 (0.89, 0.94)	0.88 (0.85, 0.92)	0.93 (0.90, 0.96)	0.88 (0.85, 0.92)	0.87 (0.83, 0.90)		

Note. CI = confidence interval; APR = adjusted prevalence ratio. All models were weighted and accounted for classroom- and regional- level clustering. All models adjusted for sex, grade, race, rurality, free and reduced lunch status, military family involvement, parental permission status, and sexual identity (high school only).

Table 3. Multiplicative and additive interaction between ACEs and protective factors on past 12-month suicidal behaviors for middle school students – 2019 Middle School Youth Risk Behavior Survey (N=5,341)

	Suicide Ideation (past 12-months)		Suicide Plan (past 12-months)		Suicide Attempt (past 12-months)	
	APR (95% CI)	APR (95% CI)	APR (95% CI)	APR (95% CI)	APR (95% CI)	APR (95% CI)
<u>Family Communication (FC)</u>						
1. Multiplicative Interaction						
	<u>Low ACE</u>	<u>High ACE</u>	<u>Low Ace</u>	<u>High ACE</u>	<u>Low Ace</u>	<u>High ACE</u>
<u>Low FC</u>	Ref	3.23 (2.52, 4.14) <i>P</i> < .001	Ref	4.28 (3.18, 5.77) <i>P</i> < .001	Ref	7.01 (4.47, 11.00) <i>P</i> < .001
<u>High FC</u>	2.39 (1.98, 2.88) <i>P</i> < .001	5.20 (4.28, 6.32) <i>P</i> < .001	2.28 (1.77, 2.95) <i>P</i> < .001	5.49 (4.25, 7.09) <i>P</i> < .001	2.80 (1.80, 4.37) <i>P</i> < .001	9.55 (6.33, 14.42) <i>P</i> < .001
Multiplicative Interaction Estimate	0.67 (0.51, 0.89) <i>P</i> = .006		0.56 (0.39, 0.81) <i>P</i> = .002		0.49 (0.27, 0.87) <i>P</i> = .015	
2. Additive Interaction						
RERI (95%CI)	0.58 (-0.34, 1.49) <i>P</i> = .229		-0.07 (-1.49, 1.35) <i>P</i> = .925		0.74 (-2.56, 4.03) <i>P</i> = .665	
<u>School Connectedness (SC)</u>						
1. Multiplicative Interaction						
	<u>Low Ace</u>	<u>High ACE</u>	<u>Low Ace</u>	<u>High ACE</u>	<u>Low Ace</u>	<u>High ACE</u>
<u>Low SC</u>	Ref	3.21 (2.63, 3.91) <i>P</i> < .001	Ref	3.31 (2.45, 4.47) <i>P</i> < .001	Ref	5.20 (3.62, 7.47) <i>P</i> < .001
<u>High SC</u>	1.76 (1.47, 2.12) <i>P</i> < .001	3.99 (3.32, 4.80) <i>P</i> < .001	2.11 (1.60, 2.78) <i>P</i> < .001	5.78 (4.64, 7.21) <i>P</i> < .001	2.17 (1.56, 3.03) <i>P</i> < .001	8.67 (6.46, 11.65) <i>P</i> < .001
Multiplicative Interaction Estimate	0.71 (0.56, 0.90) <i>P</i> = .004		0.83 (0.56, 1.23) <i>P</i> = .356		0.77 (0.48, 1.24) <i>P</i> = .227	
2. Additive Interaction						
RERI	0.02 (-0.78, 0.83) <i>P</i> = .950		1.36 (0.13, 2.61) <i>P</i> = .048		2.30 (-0.01, 4.61) <i>P</i> = .067	

Note. CI = confidence interval; APR = adjusted prevalence ratio. All models were weighted and accounted for classroom- and regional- level clustering. All models adjusted for sex, grade, race, rurality, free and reduced lunch status, military family involvement, and parental permission status

Table 4. Multiplicative and additive interaction between ACEs and protective factors on past 12-month suicidal behaviors for high school students – 2019 High School Youth Risk Behavior Survey (N=4,980)

	Suicide Ideation (past 12-months)		Suicide Plan (past 12-months)		Suicide Attempt (past 12-months)	
	APR (95% CI)	APR (95% CI)	APR (95% CI)	APR (95% CI)	APR (95% CI)	APR (95% CI)
Family Communication (FC)						
1. Multiplicative Interaction						
	<u>Low ACE</u>	<u>High ACE</u>	<u>Low Ace</u>	<u>High ACE</u>	<u>Low Ace</u>	<u>High ACE</u>
<u>No Family Communication</u>	Ref	2.73 (2.12, 3.51) <i>P</i> < .001	Ref	3.21 (2.42, 4.25) <i>P</i> < .001	Ref	2.97 (1.88, 4.70) <i>P</i> < .001
<u>Family Communication</u>	1.77 (1.41, 2.22) <i>P</i> < .001	3.53 (2.84, 4.38) <i>P</i> < .001	2.20 (1.67, 2.90) <i>P</i> < .001	4.56 (3.57, 5.82) <i>P</i> < .001	1.95 (1.34, 2.86) <i>P</i> < .001	4.21 (2.92, 6.07) <i>P</i> < .001
Multiplicative Interaction Estimate	0.73 (0.54, 0.99) <i>P</i> = .041		0.65 (0.46, 0.91) <i>P</i> = .012		0.73 (0.42, 1.27) <i>P</i> = .260	
2. Additive Interaction						
RERI (95%CI)	0.03 (-0.62, 0.67) <i>P</i> = .937		0.15 (-0.73, 1.03) <i>P</i> = .745		0.29 (-1.20, 1.78) <i>P</i> = .701	
School Connectedness (SC)						
1. Multiplicative Interaction						
	<u>Low Ace</u>	<u>High ACE</u>	<u>Low Ace</u>	<u>High ACE</u>	<u>Low Ace</u>	<u>High ACE</u>
<u>No School Connectedness</u>	Ref	3.03 (2.41, 3.82) <i>P</i> < .001	Ref	3.11 (2.39, 4.06) <i>P</i> < .001	Ref	2.90 (1.87, 4.48) <i>P</i> < .001
<u>School Connectedness</u>	1.92 (1.54, 2.39) <i>P</i> < .001	3.82 (3.04, 3.80) <i>P</i> < .001	1.77 (1.37, 2.28) <i>P</i> < .001	4.06 (3.18, 5.20) <i>P</i> < .001	2.32 (1.57, 3.41) <i>P</i> < .001	5.30 (3.93, 7.87) <i>P</i> < .001
Multiplicative Interaction Estimate	0.66 (0.50, 0.80) <i>P</i> = .002		0.74 (0.54, 1.01) <i>P</i> = .055		0.79 (0.48, 1.31) <i>P</i> = .360	
2. Additive Interaction						
RERI	-0.13 (-0.82, 0.55) <i>P</i> = .702		0.18 (-0.70, 1.07) <i>P</i> = .648		1.08 (-0.83, 2.99) <i>P</i> = .174	

Note. CI = confidence interval; APR = adjusted prevalence ratio. All models were weighted and accounted for classroom- and regional- level clustering. All models adjusted for sex, grade, race, rurality, free and reduced lunch status, military family involvement, parental permission status, and sexual identity

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Chapter 4

Adverse childhood experiences (ACEs) and co-occurring psychological distress and substance abuse among juvenile offenders: The role of protective factors

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Submitted to the *Journal of Epidemiology and Community Health*.

Funding: This research was supported by a grant from the National Institute of General Medical Sciences [P20GM103440].

ABSTRACT

Background: Co-occurrence of mental health and substance abuse problems is common among juvenile justice involved youth. The purpose of this study was to estimate associations between cumulative exposure to adverse childhood experiences (ACEs), protective factors, and co-occurrence among male and female juvenile offenders.

Methods: Validated measures of ACEs, internal resilience, external youth assets, psychological distress, and substance abuse were collected from 429 youth involved in the juvenile justice system in a Western US state. A three-level outcome variable was created using the psychological distress and substance use measures: no problems, one problem, or co-occurring problems. Hierarchical multinomial logistic regression models were used to determine the independent, direct, and moderating impact of the protective factors on ACEs and the outcome.

Results: Internal resilience, family communication, school connectedness, peer role models, and non-parental adult role models were associated with lower odds of co-occurrence compared to having no problems (AORs ranged from 0.11 to 0.33). When ACEs were added to the model, internal resilience and all assets except for one (non-parental adult role models) continued to offer protection against co-occurrence. Internal resilience was the only protective factor that significantly moderated the association between ACEs and co-occurrence (AOR: 0.24; 95% CI: 0.06, 0.99).

Conclusion: Most protective factors decreased co-occurring mental health and substance abuse problems in the presence of ACE exposure and internal resilience moderated the relationship ACEs and co-occurrence. Juvenile justice systems should utilize positive youth development approaches to help prevent co-occurrence among youth.

INTRODUCTION

An estimated 50-70% of all youth referred to juvenile justice systems across the United States have a mental health disorder,¹⁻⁴ 25-50% have a substance use disorder,⁵ and co-occurrence is common.^{1,6} Juvenile offenders with co-occurring mental health and substance abuse disorders are at increased risk of recidivism and providing treatment and services for this population is challenging.⁶ To guide the development of juvenile justice programming to address behavioral health issues, it is critical to identify primary risk and protective factors for co-occurrence of mental health and substance abuse problems.

Exposure to adverse childhood experiences (ACEs), including abuse, neglect, and other chronic stressors may contribute to the high prevalence of mental health and substance use disorders among youth involved in juvenile justice systems.⁷⁻⁹ In a large study of juvenile justice involved youth, only 3% of youth reported 0 ACEs and 50% reported experiencing four or more ACEs.¹⁰ Numerous studies of juvenile offenders have shown that ACEs are individually and cumulatively associated with mental health problems, including depression,¹¹ suicidal behavior,^{12,13} and psychiatric disorders,¹⁴ as well as substance use and abuse.^{7,15,16} However, the impact of ACEs on the co-occurrence of mental health and substance use disorders is understudied.

Research with juvenile offenders also tends to focus on problems, with little focus on resiliency or protective factors,¹⁷ but many youth are resilient and develop into healthy adults despite chronic exposure to childhood adversity.¹⁸

Resilience theory emphasizes the importance of understanding how and why some youth can overcome adversity and has important implications for strength-based approaches that build relationships, opportunities, and support systems that can help prevent behavioral health problems.¹⁹⁻²²

Few studies have assessed the influence of protective factors on mental health or substance use problems among ACE-exposed juvenile offenders. One study found that individual, family, and community level factors, including internal resilience, family communication, school connectedness, and having a peer role model, offered protection against emotional distress, even in the presence of ACEs.²³ Internal resilience and school connectedness also had a significant moderating effect on the relationship between ACEs and emotional distress.²³ Another study found that “adaptive coping resources” at the individual and interpersonal levels, including aspirations and social support, significantly moderated the association between ACEs and mental health problems.¹³ Another study found that protective adult relationships significantly moderated the association between ACEs and substance use, but that these relationships did not offer direct protection.²⁴ While these findings have important implications for positive youth development with at-risk youth, the impact of protective factors across multiple domains of influence on the co-occurrence of mental health and substance use disorders has not been assessed.

To address these critical gaps in the literature, we sought to determine: 1) if cumulative ACE exposure is associated with co-occurrence of mental health and substance abuse problems; 2) if protective factors decrease co-occurrence;

3) if protective factors decrease co-occurrence in the face of exposure to ACEs (direct effect); and 4) if protective factors moderate the relationship between ACEs and co-occurrence (interacting effect).

METHODS

Participants and Procedures

In 2014, 429 male and female youth were recruited from two juvenile justice systems in a Western state in the United States to participate in a cross-sectional study.²³ Youth were eligible to participate if they: 1) were 13-17 years of age; 2) currently involved in either of the juvenile justice systems (supervised or unsupervised); and 3) able to complete the assent and interview in English.

Supervised youth were under direct supervision of a probation officer.

Unsupervised youth were either referred to community programs for diversion, completing a sole sanction restitution, or were dismissed of charges. Youth were not eligible if they were wards of the state, were on state parole, or were in residential treatment programs during the duration of the study. Both parent/guardian consent and youth assent were obtained.

Once assent was obtained, a research team member left the youth in a private room to complete the audio computer-assisted self-interview (ACASI) or scheduled an appointment to complete the interview at a later date that did not conflict with other services or appointments. Youth were given as much time as needed to complete the survey. A member of the research team remained outside of the private room in case the youth had questions during the survey. Once the youth finished the survey, the research team member checked-in with

the youth and made appropriate referrals for services when necessary given the sensitive nature of some survey items. The study was approved by a legal representative from both juvenile justice systems and the lead investigator's University Institutional Review Board.

A total of 900 parent(s)/guardian(s) of eligible youth were approached for participation and 283 (31.4%) parent(s)/guardian(s) did not provide active or passive consent. Of the 617 youth with parent/guardian consent, 85 (13.8%) could not be approached for assent before the study period ended, Of the 532 youth who were approached to participate, 94 (17.7%) did not provide assent, 7 (1.3%) provided assent, but could not complete the survey before the study period ended, and 2 (0.4%) could not complete the survey because of cognitive impairment. The final sample size of 429 youth represented 47.7% of parents(s)/guardian(s) and 80.6% of youth who were approached.

Table 1 shows the characteristics of the study sample. Participants were primarily male (72.6%) and were racially and ethnically diverse: Hispanic (42.2%), non-Hispanic white (33.8%), non-Hispanic black (16.8%), and other race (7.2%). About half of the participants lived in a single-parent household (48.3%), and 69.3% qualified for free or reduced lunch, 55.9% were under supervision, and 26.8% were detained at the time of the interview. Study participants had similar demographic characteristics (age, sex, race/ethnicity, supervision and detainment) to the entire juvenile justice population at the recruitment sites.

Measures

Outcome (Co-occurrence of psychological distress and substance abuse)

Psychological distress during the past 7 days was measured using the Brief Symptom Inventory-18 (BSI-18).²⁵ The BSI-18 contains three subscales (depression, anxiety, and somatization) that are each measured using six items with a five-point Likert scale ranging from zero (not at all) to four (extreme). The three BSI-18 subscales were combined to create a global severity index of psychological stress with scores ranging from 0-72. For this study, a mean global severity index score above the mean ($\mu=12.8$) was considered indicative of high psychological stress.²³ The BSI-18 demonstrated excellent internal consistency in this sample (Cronbach's $\alpha = 0.93$).

The six-item CRAFFT scale was used to screen youth for a substance abuse problem.²⁶ The CRAFFT scale has high sensitivity and is an accurate screening tool for substance abuse problems among youth.^{26,27} A CRAFFT score was generated by summing the number of questions youth answered "yes" to. According to the scoring criteria, youth with a CRAFFT score of 2 or more were coded as having high risk of a substance abuse problem.²⁶ The CRAFFT demonstrated acceptable internal consistency in this sample (Cronbach's $\alpha = 0.78$).

The BSI-18 global severity index and CRAFFT scores were combined to create a three-level co-occurrence outcome: 1) BSI-18 global severity index < 12.8 and CRAFFT < 2 (no problems), 2) BSI-18 global severity index ≥ 12.8 and CRAFFT < 2 or BSI-18 global severity index < 12.8 and CRAFFT ≥ 2 (one

problem), and 3) BSI-18 global severity index ≥ 12.8 and CRAFFT ≥ 2 (co-occurring problems).

Harmful Exposure (ACEs)

The Behavioral Risk Factor Surveillance System (BRFSS) Adverse Childhood Experiences (ACEs) module²⁸ has been widely used in adult research and was adapted for use in this adolescent population. The module contains 11 questions that assess 8 domains of abuse and household dysfunction: 1) verbal abuse, 2) physical abuse, 3) sexual abuse (3 questions), 4) witnessing domestic violence, 5) household substance use (2 questions), 6) household mental illness, 7) incarceration of a family member, and 8) parental separation or divorce.²⁸

Recent research suggests that when other forms of childhood adversity such as neglect, community-level violence, and poverty are included, ACE scales may be even more predictive of poor emotional and physical health.^{13,29,30} Therefore, in addition to the standard BRFSS ACE measures, physical neglect (1 question),³¹ supervisory neglect (1 question),³¹ the death of a parent or guardian (1 question), witnessing or being a victim of neighborhood violence (1 question), and family homelessness (1 question) were included as ACEs in this study. Response to the ACE items were dichotomized as “yes” or “no”. For verbal abuse, responses by youth who experienced an ACE “more than once” were dichotomized as “yes”, while responses by youth who experienced an ACE “once” or “never” were dichotomized as “no”, consistent with recommended scoring.²⁸ To assess cumulative ACE exposure, individual ACE categories were summed to create an ACE score (range = 0-12).

Parental divorce was not included in the cumulative ACE measure because 75% of the sample reported this ACE and previous studies have not found it to be a strong predictor of mental health problems^{23,29}. For the interaction models, a dichotomous ACE score variable was created using the mean ACE score. Youth with a score above the mean ($\mu = 4.1$) and median (4.0) were classified as having a high ACE score.

Protective Exposures (Internal resilience and external assets)

Internal resilience was measured using the 25-item Connor-Davidson Resilience Scale (CD-RISC).³² The CD-RISC is designed to assess multidimensional components of resilience (e.g. positive acceptance of change and trust in one's instincts) and has high internal consistency, test-retest reliability, and validity.³² All items are rated on a five-point Likert scale ranging from zero (not true at all) to four (true nearly all of the time). The CD-RISC items were summed to create a score ranging from 0 to 100, with higher scores reflecting higher resilience. In the current sample, the CD-RISC demonstrated high excellent consistency (Cronbach's $\alpha = 0.93$). A dichotomized variable was created in which youth with scores above the mean ($\mu = 67.2$) were classified as having high internal resilience.

Four external assets (family communication, school connectedness, peer role models, and nonparental adult role models) were measured using multi-item constructs from the Youth Asset Study with established reliability and validity.³³ Each asset was measured using three or four items scored on a four point Likert scale ranging from one (almost never/strongly disagree) to four (almost

always/strongly agree). Based on scoring recommendations from the survey developer, items within each external asset construct were and divided by the total number of items to create a mean score ranging from one (almost never/strongly disagree) to four (almost always/strongly agree).³³ Youth with a score of three or higher were coded as having the asset, while youth with a score of less than three were coded as not having the asset. The reliability of the assets in this sample was: 1) family communication (Cronbach's $\alpha = 0.83$), 2) school connectedness (Cronbach's $\alpha = 0.79$), 3) peer role models (Cronbach's $\alpha = 0.81$), and 4) nonparental adult role models (Cronbach's $\alpha = 0.60$).

Covariates

Consistent with previous research, sociodemographic and juvenile justice characteristics included: sex (male vs. female), age (13-15 vs. 16-17), race/ethnicity (Hispanic, non-Hispanic white, non-Hispanic black, and other), current custody status (both parents, single parent, and other), current supervision status (supervised vs. unsupervised), detained at time of interview (yes vs. no), and site.^{9,23}

Analyses

First, we compared cumulative the ACE score and the prevalence of protective factors among those with no problems, one problem, and co-occurring problems. T-tests were used for continuous variables and chi-square tests were used for categorical variables. Bonferroni correction was used to adjust for multiple comparisons (adjusted p-value cutoff = 0.003).³⁴

Second, we used multinomial logistic regression to measure the association between the cumulative ACE score and the three-level psychological distress and substance abuse outcome [no problems (reference category), one problem, or co-occurring problems]. Next, for each of the five protective factors, we used a series of hierarchical multinomial logistic regression models to determine the: 1) independent, 2) direct, and 3) moderating impact of the protective factors on ACEs and the outcome. For each hierarchical set of models, model 1 included only the protective factor, model 2 included the protective factor and cumulative ACE score, and model 3 included the protective factor, a high ACE score variable, and a protective factor x high ACE score interaction term. All multinomial logistic regression models adjusted for sex, age, race/ethnicity, custody status, location, supervision status, detainment status, and qualification for free or reduced lunch. All analyses were conducted using SAS v 9.4 (SAS Institute, Cary NC).

RESULTS

Table 2 shows the prevalence of ACEs, protective factors, and the three-level psychological distress and substance abuse outcome. Individual ACEs were common with over half of participants reporting household substance use (62.9%), family member incarceration (61.5%), witnessing or being the victim of neighborhood violence (55.0%), and verbal abuse (50.3%). On average, youth reported 4.1 ACEs. Protective factors were also common with over half of youth reporting high internal resilience (52.0%) and school connectedness (51.0%). One-fourth (26.6%) of youth had neither high psychological distress or a

substance abuse problem (no problems), 42.3% had either high psychological distress or a substance abuse problem (one problem), and 31.1% had high psychological distress and a substance abuse problem (co-occurring problems). As shown in Table 3, the mean ACE score significantly increased as the number of problems increased: no problems ($\mu = 2.2$), one problem ($\mu = 4.0$), and co-occurring problems ($\mu = 5.9$). Conversely, the prevalence of protective factors typically decreased as the number of problems increased.

The results of the hierarchical, fully adjusted multiple regression models are shown in Table 4. In the first model (ACE score only), a one-unit increase in ACE score was associated with almost twice the odds of co-occurrence compared to no problems (AOR: 1.90; 95% CI: 1.64, 2.20). All protective factors decreased the odds of co-occurring problems (AORs ranged from 0.11 to 0.33). All but one of these protective factors (having a nonparental adult role model) continued to decrease the odds of co-occurring problems even in the presence of ACEs (AORs ranged from 0.21 to 0.41). Internal resilience significantly moderated the association between ACEs and co-occurring problems in the interaction model (AOR: 0.24; 95% CI: 0.06, 0.99). There was a significant association between cumulative ACE score and having one problem, but this was not as strong as the association between ACE score and co-occurrence. Three protective factors decreased the odds of one problem in the face of ACEs, but no significant interactions were detected.

DISCUSSION

We aimed to estimate associations between cumulative ACE exposure, protective factors, and co-occurrence of psychological distress and substance abuse in a sample of juvenile justice involved youth. Consistent with previous research, ACEs were common among participants in our study¹⁰ and we observed a graded relationship between cumulative exposure to ACEs and co-occurrence. These findings highlight the importance of trauma-informed approaches to service delivery in juvenile justice settings.³⁵ It is noteworthy that youth with co-occurrence had greater ACE exposure than youth with single problems (high psychological distress or a substance abuse problem alone), but protective factors also had a stronger influence on co-occurrence. Internal resilience, family communication, school connectedness, having a peer role model, and having a nonparental adult role model reduced the odds of co-occurrence by 70-90%. Furthermore, we found all protective factors, except having a nonparental adult role model, continued to offer protection against co-occurrence in the presence of ACEs (direct effect), and internal resilience moderated the relationship between ACE exposure and co-occurrence (interacting effect).

These findings build on previous studies focusing on single behavioral health problems^{13,23,24} and suggest that positive youth development programs may be particularly useful for juvenile offenders with co-occurring mental health and substance abuse problems. While juvenile justice systems have historically employed deficit-based approaches,^{17,36,37} recent initiatives at both state and local levels have employed strength-based frameworks that provide youth with

opportunities, positive relationships, and support systems.^{17,38} Positive youth development approaches have been shown to promote resilience resources among at-risk youth exposed to abuse and neglect and improve well-being³⁹. Our results suggest that such approaches may also minimize the impact of ACEs on co-occurrence of substance abuse and mental health problems. Future research should continue to evaluate the impact of interventions for juvenile offenders that promote positive factors across individual, family, and community domains.^{17,38,40}

Limitations and Strengths

This study had several limitations. First, due to the cross-sectional nature of the study, the temporal relationship between ACEs, internal resilience, and external assets and co-occurrence cannot be established. Second, a limited number of protective factors (5) were assessed. Future studies could include a wider range of protective factors across multiple domains of influence. A third limitation is that there is potential for dependent error in measurement of the exposures and outcome in this study, however, the use of ACASI technology for data collection minimizes the potential for this error. Fourth, while we controlled for many covariates, there is potential for residual confounding by unmeasured characteristics. Fifth, although our analyses controlled for important characteristics, including detainment and supervision status, we did not stratify our analyses by these characteristics. Future studies could inform the development of more specific interventions by identifying the protective factors that are most important for youth in different levels of the juvenile justice system.

Finally, the overall response rate was low; however, characteristics of study participants were similar to the entire juvenile justice population at the recruitment sites. Despite these limitations, this study is one of the first to explore associations between ACEs, internal resilience, external assets and the co-occurrence of psychological distress and a substance abuse problem in a sample of juvenile justice involved youth. Another strength of this study was the use of well-established, valid measures of ACEs, internal resilience, external assets, psychological distress, and risk of a substance abuse problem.

Conclusions

In summary, we found protective factors (internal resilience and external assets) have direct and moderating effects on the relationship between ACEs and co-occurrence of psychological distress and substance abuse. These findings highlight the importance of developing tailored, strength-based initiatives to help juvenile justice involved youth.

Table 1. Characteristics of participants in the Juvenile Justice Adverse Childhood Experiences Study (JJACE) (N=429)

	Total N (%)
Sociodemographics	
Sex	
Male	310 (72.6)
Female	119 (27.4)
Age group	
13-15	260 (60.6)
16-17	169 (39.4)
Race/Ethnicity	
Hispanic	181 (42.2)
Non-Hispanic white	145 (33.8)
Non-Hispanic black	72 (16.8)
Other	31 (7.2)
Current custody	
Both parents	185 (43.1)
Single parent	207 (48.3)
Other	37 (8.6)
Qualified for free or reduced lunch	294 (69.3)
Supervision status	
Supervised	240 (55.9)
Unsupervised	189 (44.1)
Detained at time of interview	115 (26.8)

Table 2. Prevalence of adverse childhood experiences (ACEs), protective factors, and behavioral health outcomes among participants in the Juvenile Justice Adverse Childhood Experiences Study (JJACE) (N=429)

	Total N (%)
Adverse childhood experiences (ACEs)	
Individual ACEs	
Verbal abuse	213 (50.3)
Physical abuse	133 (31.8)
Sexual abuse	67 (15.7)
Witness domestic violence	128 (30.8)
Household substance abuse	270 (62.9)
Household mental illness	165 (38.5)
Family member incarceration	260 (61.5)
Physical neglect	73 (17.4)
Supervision neglect	109 (25.8)
Death of parent/guardian	64 (15.0)
Witness/victim of neighborhood violence	232 (55.0)
Homelessness	38 (8.9)
Cumulative ACE score [Mean(SD)]	4.1 (2.8)
Protective factors	
High internal resilience ^a	220 (52.0)
Family communication	106 (37.7)
School connectedness	214 (51.0)
Peer role models	157 (37.3)
Nonparental adult role model	274 (34.6)
Psychological distress, substance abuse, and co-occurrence	
High psychological distress ^b	
Yes	161 (37.7)
No	266 (62.3)
Substance abuse (CRAFFT)	
Yes	278 (66.5)
No	140 (33.5)
Co-occurrence of psychological distress and substance abuse	
Neither	111 (26.6)
One	177 (42.3)
Both	130 (31.1)

^a High internal resilience > mean CD-RISC score

^b High psychological distress > mean BSI-18 score

Table 3. Prevalence of adverse childhood experience (ACEs) and protective factors, by differing levels of behavioral health problems (N=429)

	No problem <u>No</u> psychological distress or substance use	One problem Psychological distress <u>or</u> substance abuse	Co-occurring problems Psychological distress <u>and</u> substance abuse	Significance
	N (%)	N (%)	N (%)	
Cumulative ACEs				
Mean ACE score (SD)	2.2 (2.2)	4.0 (2.5)	5.9 (2.6)	a b c
Protective Factors				
High internal resilience ^d	70 (63.6)	96 (54.9)	48 (36.9)	b c
Family communication	70 (63.6)	60 (34.1)	27 (20.8)	a b c
School connectedness	73 (67.0)	84 (48.0)	53 (41.4)	a b
Peer role models	67 (60.9)	60 (34.5)	26 (20.2)	a b c
Nonparental adult role model	87 (79.1)	117 (68.0)	67 (51.9)	b

Note. T-tests were used to tests for differences in mean ACE score between groups. Chi square tests were used to test for differences in the prevalence of protective factors. Bonferroni adjustment p-value cutoff = 0.003.

^a No problem vs. one problem (p-value < 0.003)

^b No problem vs. both problems (p-value < 0.003)

^c One problem vs. both problems (p-value < 0.003)

^d High internal resilience > mean CD-RISC score

Table 4. Influence of adverse childhood experiences (ACEs) and protective factors on the behavioral health outcomes (N=429)

		One Problem^{a,b}	Co-occurring Problems^{a,c}
		AOR (95% CI) ^d	AOR (95% CI) ^d
High Internal Resilience	ACE score	1.41 (1.24, 1.59)	1.90 (1.64, 2.20)
	High internal resilience ^e	0.73 (0.43, 1.25)	0.31 (0.17, 0.56)
	ACE score	1.40 (1.24, 1.59)	1.87 (1.61, 2.16)
	High internal resilience ^e	0.83 (0.47, 1.46)	0.40 (0.20, 0.78)
	High ACE score ^d x High internal resilience ^e	0.34 (0.09, 1.23)	0.24 (0.06, 0.99)
Family Communication	ACE score	1.41 (1.24, 1.59)	1.90 (1.64, 2.20)
	Family communication	0.26 (0.15, 0.44)	0.11 (0.06, 0.22)
	ACE score	1.32 (1.16, 1.50)	1.75 (1.50, 2.03)
	Family communication	0.39 (0.22, 0.69)	0.27 (0.13, 0.56)
	High ACE score ^d x Family communication	0.78 (0.21, 2.98)	0.91 (0.21, 4.00)
School Connectedness	ACE score	1.41 (1.24, 1.59)	1.90 (1.64, 2.20)
	School connectedness	0.45 (0.26, 0.77)	0.33 (0.18, 0.59)
	ACE score	1.39 (1.23, 1.58)	1.88 (1.62, 2.17)
	School connectedness	0.47 (0.27, 0.83)	0.41 (0.21, 0.80)
	High ACE score ^f x School connectedness	0.95 (0.26, 3.44)	0.51 (0.12, 2.11)
Peer Role Model	ACE score	1.41 (1.24, 1.59)	1.90 (1.64, 2.20)
	Peer role model	0.39 (0.23, 0.66)	0.16 (0.08, 0.29)
	ACE score	1.37 (1.21, 1.55)	1.83 (1.58, 2.12)
	Peer role model	0.46 (0.26, 0.80)	0.21 (0.10, 0.43)

	High ACE score ^f x Peer role model	2.03 (0.56, 7.31)	1.10 (0.25, 4.82)
Nonparental Adult Role Model	ACE score	1.41 (1.24, 1.59)	1.90 (1.64, 2.20)
	Nonparental adult role model	0.57 (0.32, 1.04)	0.31 (0.17, 0.57)
	ACE score	1.41 (1.24, 1.61)	1.88 (1.62, 2.18)
	Nonparental adult role model	0.84 (0.45, 1.59)	0.61 (0.30, 1.24)
	High ACE score ^f x Nonparental adult role model	0.89 (0.22, 3.56)	0.43 (0.09, 2.00)

Note. AOR = adjusted odds ratio; CI = confidence interval

^a Referent group = no problem

^b High psychological distress or substance abuse problem

^c High psychological distress and substance abuse problem

^d Multinomial logistic regression model adjusted for sex, age, race/ethnicity, custody status, location, supervision status, detainment status, and qualification for free or reduced lunch

^e High internal resilience > mean CD-RISC score

^f High ACE score > mean ACE score

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Chapter 4

Conclusions: Summary of Findings, Future Directions, Public Health Implications

CONCLUSIONS

It is well-established that exposure to childhood adversity contributes significantly to substance use and mental health problems in adolescence¹ and there is increasing evidence that positive factors, like resilience and assets, can protect youth from these problems.² However, less is known about how adversity, resilience, and assets operate together to influence substance use and mental health problems. The general aims of this dissertation was to: 1) explore whether resilience and/or assets can offer protection against substance use and mental health problems in the face of adversity (direct protective effect); and 2) explore whether resilience and/or assets can buffer the relationship between adversity and substance use and mental health problems (interacting protective effect).

Summary of Findings

In the first study, I used data across a four year period from a cohort of 1,111 youth to determine the prospective influence of cumulative youth assets within individual, family, and community domains on binge drinking in the presence of negative life events (NLEs). Additionally, I aimed to determine whether high levels of assets in each domain buffered the association between exposure to NLEs and binge drinking. There was evidence that cumulative assets in each domain offered protection against binge drinking in the presence of NLEs. However, there was no evidence that assets in any domain buffered the influence of NLEs on binge drinking on the multiplicative or additive scales.

In the second study, I aimed to determine whether family communication and school connectedness offered direct protection against suicide ideation, plan, and attempt in the presence of ACEs and whether these assets buffered the relationship between ACEs and suicidal behaviors. Using large, representative samples of 5,000 middle school youth and 5,000 high school youth, I found evidence to support both of these aims. Specifically, a one-unit increase in family communication and school connectedness scores were associated with a lower prevalence of all suicidal behaviors in the presence of ACEs for both middle school and high school youth. Further, there was evidence of interaction (buffering) between high levels of family communication or school connectedness and high ACE score on the multiplicative scales for middle school and high school youth. The influence of ACEs and interaction estimates were generally stronger for middle school youth.

In the third study, I aimed to determine whether internal resilience and four external assets (family communication, school connectedness, peer role models, and non-parental adult role models) offered protection against co-occurrence of psychological distress and substance abuse in a sample of juvenile justice involved youth. I also sought to determine if any of these protective factors buffered the relationship between ACEs and co-occurrence. Internal resilience and most external assets (family communication, school connectedness, peer role models) offered direct protection against co-occurrence of high psychological distress and substance abuse in the presence of ACEs among juvenile justice involved youth. Further, there was significant multiplicative interaction between

high internal resilience and high ACE score, suggesting some evidence of buffering.

Each of these studies had unique strengths and limitations. The first study was longitudinal and had valid and reliable multi-item constructs to measure seventeen assets across individual, family, and community domains. However, the binge drinking outcome was only measured using a single item and the NLE module did not measure more serious forms of adversity such as abuse, neglect, or household dysfunction. Further, the data were collected from 2003/2004 to 2008/2009 and the findings may not be completely generalizable to today's youth.

The second study utilized recently collected data from large, representative samples of approximately 5,000 middle school and 5,000 high school youth. However, these cross-sectional data were collected as part of a surveillance project, and thus contained a limited number of ACE items and only measured two assets (family communication and school connectedness).

The third study utilized data from a sample of juvenile justice involved youth, who are an important at-risk subgroup who experience higher levels of adversity. This study had strong ACE measures and valid and reliable measures of resilience, assets, psychological distress, and substance abuse. However, it was a cross-sectional study of a small convenience sample of juvenile justice involved youth. All of the research studies included were limited by potential dependent error as interviews or surveys were used to collect exposure, outcome, and protective factor information.

Future Directions

There is a clear need to advance the investigation of the role that resilience and assets have in protecting youth from substance use and mental health problems. Longitudinal studies of adolescents with strong, validated measures of ACEs, resilience, assets, substance use and abuse, and mental health problems are warranted for advancing this research. Such research could investigate whether resilience and assets can have a greater influence on substance use and mental health outcomes at different periods in adolescence by using analytic techniques like growth curve modeling to measure how these relationships differ across groups of adolescents or within adolescents over time.³ Longitudinal studies are also ideal for studying whether resilience and assets have curvilinear relationships with adversity using challenge models. Challenge models posit that some level of adversity may actually benefit youth, but too much adversity can have strong negative influence on health and development.²

Given the potential for dependent error in all three studies, future studies could utilize objective measures of substance use, mental health problems, and adversity, such as DSM diagnoses, medical records or other clinical data, and child abuse and neglect reports, to minimize problems with dependent error from self-reported data. Effect modification was not assessed in any of these three studies and therefore, research investigating specific subgroups of youth is warranted. For example, future studies could examine/investigate/explore whether the protective influence of resilience and assets varies for different youth

sub-populations based on sex, sexual and gender identity, age, and race/ethnicity.

As studies continue to highlight the importance of resilience and assets, there is also a need to develop interventions that utilize a strengths-based approach to improve the health and well-being of youth. Future studies using a family-, school-, or community-based randomized cluster trial design⁴ or stepped-wedge trial design⁵ could evaluate the efficacy of such interventions. In addition to family-, school-, and community-based interventions, the findings from the third study highlight the need for interventions tailored for youth involved in juvenile justice systems who experience a great deal of trauma and adversity.^{6,7}

Public Health Implications

In all three studies, resilience and assets provided direct protection against substance use and mental health problems in the presence of adversity. Further, there was some evidence that internal resilience and certain assets, such as family communication and school connectedness, can buffer the relationship between ACEs and suicidal behaviors and co-occurrence of substance abuse and mental health problems. Collectively, the findings from this dissertation provide support for the development and implementation of strength-based approaches that build and strengthen resilience and assets across multiple levels of influence. Given the difficulties with primary prevention of childhood adversity, secondary prevention efforts to develop strength-based programs and interventions are especially important.⁸ Nationally, the *Healthy People 2020* initiative has recognized the importance of strength-based, positive

youth development strategies that involve families, schools, and communities, to improve adolescent health.⁹ There is a continued need to recognize and prioritize these approaches at national and local levels.

It is also important to note that despite the evidence of direct protective and buffering effects of resilience and assets in these studies, adversity (particularly ACEs) continued to have a strong, negative influence on substance use and mental health problems. These findings warrant the development of trauma-informed programming that recognizes the influence of adversity of substance use and mental health problems. Further, the high prevalence of adversity, substance use, and mental health problems across all three studies highlights need to implement screening and targeted risk assessment efforts in schools, communities, and juvenile justice systems, to identify at-risk youth and provide them with appropriate services and referrals.

Conclusions

While NLEs and ACEs have strong, graded relationships with substance use and mental health problems, these three studies provide evidence that resilience and assets can offer direct protection against these problems in the presence of adversity. Further, internal resilience and certain assets, such as family communication and school connectedness, can buffer the relationship between ACEs and suicidal behaviors and co-occurrence of substance abuse and mental health problems. However, even with the direct protective and buffering influence of resilience and assets, adversity (particularly ACEs) continued to have a negative influence on behavioral health problems.

Collectively these findings highlight the need for strength-based and trauma-informed approaches to reducing substance use and mental health problems among youth.

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