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Adverse Childhood Experiences and Alcohol Use Trajectories in College Students

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Adverse Childhood Experiences and Alcohol Use Trajectories in College Students

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ABSTRACT

Adverse Childhood Experiences and Alcohol Use Trajectories in College Students

Rebekah L. Damitz

Heavy alcohol use during college can result in numerous negative outcomes (e.g., accidents, worse academics, risky sexual behaviors, etc.). Understanding the risk-factors associated with elevated alcohol use in college are needed so prevention and/or interventions can be implemented to inhibit such dangerous behavior. Adverse childhood experiences have been identified as one key factor in the initiation and escalation of alcohol use, but there is limited research on samples that are in emerging adulthood. Specifically, the transition to college is a time when many students escalate drinking and can form the basis for longer term drinking patterns. It is not yet clear how adversity impacts this critical transition in terms of alcohol use patterns. Thus, the goal of this study was to identify these alcohol use behaviors among college freshmen already at risk for higher levels of alcohol use. The current study utilized data from the College Student Transition Study at a large Mid-Atlantic university to examine alcohol use trajectories of college freshmen across their first year of university. Seven hundred and sixty-nine participants (M_{age} = 18.61 years, SD = 0.33, range = 18.09 – 20.11; 50.71% female; 90.25% White), mostly from the Appalachian region, completed an online Qualtrics survey assessing demographic information, their experience of childhood adversity, and average alcohol use, among other variables. Unconditional and conditional latent growth curve models were assessed in Mplus to examine change across four waves of data, and whether the experience of childhood adversity predicted elevated alcohol use at baseline and steeper increases in use over the first year of college. There was significant variability in intercept, slope, and curvature. The typical pattern was an increase in alcohol use during the immediate transition to college, but then there was a significant decline during the end of the spring semester. Results suggested that adversity significantly predicted variability in the quadratic effect (curvature), showing that those with higher adversity experienced a sharper decrease in alcohol use during the spring semester. Findings can be used to inform alcohol use awareness programs for those who have faced higher levels of childhood adversity.

ACKOWLEDGMENTS

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College is a time when many young adults begin experimenting with substances, including alcohol, tobacco, and illicit drugs (Schulenberg et al., 2020; Skidmore et al., 2016; Welsh et al., 2019). Multiple national panel studies have found that high school students who went on to college consume larger quantities of alcohol and drink more frequently compared to their same-age counterparts who did not go to college (Carter, Brandon, & Goldman, 2010; Merrill & Carey, 2016; O'Malley & Johnston, 2002; Partrick & Terry-McElrath, 2016). More recent evidence shows the typical escalation of alcohol use from high school to college with 64% of high school seniors reporting some alcohol use, which increases to 81% among college freshman (Patrick & Schulenberg, 2014; SAMSHA, 2019). Moreover, only 17% of high school seniors report heavy (e.g., binge drinking) in the past 30 days whereas 32% of college freshman report heavy levels of drinking. This excessive alcohol use can have detrimental effects on young adult's development such as worse academic outcomes (e.g., lower grades and worse class attendance; Wolaver, 2002), risky sexual behaviors (e.g., infrequent condom use; Baliunas et al., 2010), and longer-term patterns of heavier drinking (Arria et al., 2008; Johnston et al., 2014).

Due to the negative outcomes associated with increased alcohol intake during the transition to college, there is interest in identifying the individual characteristics that leads to escalations in alcohol consumption after entering college and thus increasing a risk of a host of detrimental outcomes. One key predictor that has received recent attention is childhood adversity. Greater exposure to adverse experiences early in life predicts a host of alcohol related use and problems in adolescence and adulthood (Colder, 2001; Dube et al., 2002; Dube et al., 2006; Enoch, 2011; Espeleta et al., 2018). Thus, the current study will use retrospective reports of childhood adversity to determine if this exposure predicts elevated alcohol intake prior to

starting college, as well as greater increases in intake during the first year of college in a large

sample of university students living in the Appalachian region of the United States.

Childhood Adversity

Childhood adversity is typically described as any stressful experience or set of

experiences that impact typical development across the lifespan (Anda et al., 2006). Historically,

researchers have utilized different labels to quantify such events such as childhood abuse,

trauma, neglect, or adversity (Malinosky-Rummell & Hansen, 1993), but what they all have in

common is they involve some type of non-normative physical, emotional, and/or social force that

can impact lifelong development. Although there is a rich history of exploring how early life

events impact health and development, it was not until the late 1990s when researchers started to

develop a more standard approach to assessing negative early life events. This shift partly

occurred with Vincent Felitti's funded work with the Kaiser Permanente's San Diego Health

Appraisal Clinic, one of the nation's largest medical evaluation centers. Felitti and colleagues

(1998) utilized a sample of 9,508 adults (M_{age} = 56.1 years, 52% female, 79.4% White) to assess

dozens of self-reported adversities patients experienced before age 18. Using the most commonly

reported adversities among participants, Felitti created the Adverse Childhood Experiences

(ACEs) scale (Appendix A) which consisted of 7 types of adversities (later updated to 0 to 10)

tabulated with a sum score so that higher numbers indicate greater adversity (e.g., physical,

emotional, sexual abuse; parent going to jail, etc.). Two out of three participants (67%) had

reported experiencing at least one ACE, more than 1 in five (20%) reported three or more ACEs,

and 1 out of eight (13%) reported four or more ACEs. The most prevalent ACE among

participants was substance abuse in the household (25.6%) and the least prevalent was criminal

behavior in household (3.4%). Results of this seminal study suggested that as the number of

childhood exposures increased, the prevalence and risk increased for several negative health

behaviors including smoking, physical inactivity, depressed mood, suicide attempts, alcoholism,

injection of illicit drugs, and history of sexual transmitted diseases. Felitti and colleague's (1998)

ACEs measure of adversity was much broader than earlier measures of adversity – by asking

participants about many types of abuse and negative events – thus, providing the necessary

foundation to more fully capture the panoply of ACEs that could impact the physical and mental

health of individuals.

National estimates from the United States (U.S.) in 2017-2018 suggest that about 23.3%

of youth (aged 0-17) have experienced at least one ACE and 18.6% had experienced two or more

ACEs (Child and Adolescent Health Measurement Initiative, 2018). However, it is difficult to

estimate the true prevalence of childhood adversity because some individuals do not remember

that such adversity occurred perhaps because they were too young, or they do not wish to report

such occurrences out of shame or guilt. This is why some researchers suggest that upwards of

about half of all children will experience adversity at some point during their childhood

(McLaughlin et al., 2013). In certain geographic regions, like West Virginia and other parts of

rural Appalachia, the frequency of ACEs might be even higher as this area is ranked among the

highest in the U.S. for both substance abuse exposure and adverse childhood experiences that

often include low socioeconomic status and residing in a single-parent households (USADHHS,

2014; WV Health Statistics Center, 2019).

Since Felitti's seminal work, there has been a growing interest in showing how ACEs

predict a host of negative outcomes across the lifespan. For example, ACEs can contribute to

poorer overall physical health (Luby et al., 2017; Mersky et al., 2013), an increased risk of

cardiovascular disease (Pretty et al., 2013; Su et al., 2016), diabetes (Monnat & Chandler, 2017),

asthma (Iniquez & Stankowski, 2016; Wing et al., 2015), increased levels of psychopathology

(Karatekin, 2017; Luby et al., 2017; Schilling et al., 2007), and premature death (Kelly-Irving et

al., 2013). With these negative health consequences now well-known, research interest has

shifted to identifying the behaviors and coping mechanisms responsible for the deterioration of

lifespan health among those who are exposed to early life adversity. The current study sought to

further understand these processes by connecting early adversity to an increased use of alcohol

during the transition to college –a key developmental transition in the life of emerging adults.

Alcohol Use During Transition to College.

Alcohol is the most widely used substance among college students (Johnston et al., 2014;

Jones et al., 2010). Data from the 2014 National Survey on Drug Use and Health (Lipari & Jean-

Francois, 2016) reported about 5.4 million (60.1%) full-time students aged 18-22 drank alcohol

in the past month. Full-time college students report consuming an average of 4.1 drinks on each

drinking occasion (Lipari & Jean-Francois, 2016). Comparing these national estimates of alcohol

use in college aged students to studies that have specifically examined freshman students

suggests somewhat lower average estimates. Prince et al. (2019) followed students ($N = 347$)

across several waves of data at a midsized public northeastern university and found that at the

start of freshman year, the students reported between 2.91 and 3.43 drinks. Fazzino et al. (2019)

asked 103 incoming freshmen utilizing a college-wide representative sample about alcohol use

and found that they consumed 2.6 drinks per occasion on average. Internationally, Pilatti et al.

(2017) found that a sample of Argentinean college freshmen ($N = 4,083$, $M_{age} = 19.39$) drank

between 3-5 drinks per occasion.

Another study (Patrick & Terry-McElrath, 2016) found that heavy alcohol use was

common among 1,657 young adults (surveyed in 12th grade and followed up with at 19/20 years

old) with 24% who reported having 5+ drinks in a row in the past 2 weeks in the second assessment. The results indicate that participants in college and not living with parents were more likely to engage in binge drinking or report levels of moderate/high intoxication. Of those attending college in the sample ($N = 772$), 29% reported drinking 5+ drinks in the last two weeks. Overall, the transition to college is a period marked with increased alcohol use for a number of reasons, including access and less parental monitoring (Vaughan et al., 2009).

Several longitudinal studies have followed students during their transition into college and have provided somewhat conflicting evidence as to whether drinking escalates among this student population. A study of 388 students followed over their freshman and sophomore years showed that average alcohol use and alcohol related problems typically increased over that time (Capone et al., 2007). Likewise, a two-year longitudinal study at a large Northeastern public University found that drinking on weekends typically increased over time but increases were steepest during the initial transition to college (Abar et al., 2009). Researchers that utilized 3 consecutive cohorts of freshmen to learn more about how drinking behaviors changed during the initial transition to college found that although freshman typically drink excessively when they do decide to drink, their frequency of drinking is less consistent over time (Del Boca et al., 2004). In other words, there are weeks when students are typically binge drinking both nights of the weekend, but there are other weeks when they do not drink at all. One research team recruited a sample of only heavy drinkers at baseline and found alcohol intake slightly decreased over the first year in college (Hustad et al., 2009).

Some of the conflicting evidence of whether there are increases or decreases in alcohol use during the transition to college might be because of the statistical modeling approach being utilized. When studies utilize a latent growth curve approach, not only is error reduced in

estimating change, but they are able to look at curvilinear effects. For example, some research suggests that a quadratic model best describes alcohol use over freshman year. Specifically, there is in initial increase in alcohol consumption over the first semester, only to slightly decrease/level-off during the spring semester (Del Boca et al., 2004). Such statistical methods are critical to utilize because of the flexibility in modeling a behavior that might vary by population (e.g., males versus females) and by timing (e.g., holiday breaks, spring break). Research has shown variability in alcohol use behaviors based on several demographics, including race and sex. For example, a 2017 study that analyzed alcohol use data from the Youth Risk Behavior Survey of US high school students from 1991-2015 (Ns ranged from 10,904 - 16,410) found that males engaged in current drinking and binge drinking behaviors more often than females (Esser et al., 2017). The authors also found that current and binge drinking behaviors were significantly higher for non-Hispanic White and Hispanic students than for non-Hispanic Black students.

An extension of the latent growth curve model is the growth mixture model where researchers can group individuals into trajectory groups. For example, although the average pattern of alcohol use might be increases over time, there might be some individuals who increase a lot, whereas a different group of individuals increases only modestly. Moreover, there might be a group that stays stable or even declines in their alcohol use over time. One longitudinal study of 3,418 college students (aged 18-25) investigated binge-drinking trajectories of alcohol use finding that although most of the sample (66.71%) reported binge drinking at some wave of data, 4 trajectory classes emerged from the data: *Dabblers* or those reporting low levels of binge-drinking over time [89.94%], *Slow Decelerators* or those reporting moderate levels of binge-drinking in the early years and then slow declines over time [7.35%], *Accelerators* or those reporting low rates of binge-drinking in the early years and then rapid

increases over time [1.86%], and *Fast Decelerators* or those reporting the highest level of binge-drinking in the early years but quick declines [0.84%]) of binge-drinking (Haardörfer et al., 2021). While the largest group of students were identified as *dabblers*, this study highlights the importance of examining drinking behaviors of college students across several waves of data. Within these growth mixture models, it is possible to identify factors that predict what type of drinker someone will be over time. For example, it was found that women were more likely to dabble or even reduce their binge-drinking compared to men; being White and living in a rural area also predicted higher baseline drinking behaviors and greater increases over time. Although SES was not directly measured, higher parental education and attending private institutions also predicted increased alcohol use. In sum, the evidence shows that changes in drinking behavior over the college transition are not as straightforward as students increase or decrease. Rather, there is much individual variability in alcohol use change over time and identifying the predictors of this change is necessary to understand who is truly at risk for escalations of alcohol use and associated problems in college.

Adversity and Alcohol Use

Researchers have long known that children exposed to adversity are an increased risk of initiating the use of a variety of different substances such as substance use earlier in life (Anda et al., 1999; Dube et al., 2006; Dube et al., 2003; Hodson et al., 2006). Studies of youth samples (assessed through childhood to age 15; Blomeyer, et al., 2008) and adult samples (Anda et al., 2006; Mersky et al., 2013) have found that experiencing childhood adversity predicts an earlier onset of drinking behaviors, increased average use of alcohol (Rothman et al., 2008), self-reported alcoholism (Dube et al., 2002), and meeting criteria for a diagnosis of alcohol dependence disorder (Enoch, 2011; Lloyd & Turner, 2008). Prior work using a large US sample

of adults ($N = 3,592$; ages 18-39) found that individuals who reported higher levels of adverse childhood experiences (e.g., physical/sexual abuse, substance abuse in home, marital discord/divorce) were at a greater odds of having started drinking prior to age 14, most notably to cope with what they experienced (Rothman et al, 2008). One study at a large Midwestern university assessed ACEs, using Felitti's measure, and drinking among 668 college students (aged 18-54; Espeleta et al., 2018). The results indicated that those who experienced a higher total ACEs score had an increased risk of problematic substance use (e.g., missed work or classes due to drinking or being hungover, have taken foolish risks while drinking, felt sick or threw up due to drinking, etc.) (Kahler, Strong, & Read, 2005). Another study of 330 first- and second-year undergraduates (aged 18-24) in Taiwan examined drinking behaviors using the Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) and ACEs using the Chinese version of the Adverse Childhood Experience Questionnaire. Undergraduates who reported experiencing early life adversity also reported higher frequencies of alcohol use and higher degrees of alcohol problems in the last six months, compared to those not reporting such adversities (Lee & Feng, 2021). All of these studies provide key evidence for associations between early adversity and alcohol use, but they are limited because they cross-sectional in nature.

Some longitudinal studies that have explored alcohol use trajectories in college-aged individuals have typically utilized narrow measures of early adversity. For example, Berenz et al. (2017) used latent growth modeling to assess alcohol use change over 3 waves across the first year of college in a sample of 1197 freshmen who been exposed to potentially traumatic events (i.e., natural disasters, physical assaults, sexual assaults, other unwanted or uncomfortable sexual experiences, and transportation accidents). In female participants, greater trauma predicted increased alcohol consumption at baseline, but trauma did not predict change in alcohol use

among males nor females. Another study looked also looked at a specific trauma in terms of more recent sexual victimization (Griffin et al., 2013). Researchers selected a sample of 169 individuals who met criteria for a either a prior (before age 17) or more recent (between ages 17-18) sexual victimization defined broadly as "a range of sexual experiences that occur without consent". They then measured alcohol use over 6 occasions across their freshman year. Although prior and more recent sexual victimization were both associated with increased alcohol use, those with more recent victimization had greater baseline and increases in alcohol use compared to those who had experienced victimization earlier in life. Although specific timing of the trauma was not recorded in the study, findings highlight the limitations with many adversity measures in that the timing of when they occur may be important to consider.

Read and colleagues (2012) used a large sample of college freshman (N = 997) and measured whether baseline levels of trauma predicted alcohol use change across 6 waves during freshman year. Trauma exposure was captured with the Traumatic Life Events Questionnaire which assesses whether they were exposed to a set of experiences such as accidents, death of a loved one, physical/sexual assault, etc. In addition, the authors examined whether the trauma they experienced resulted in symptoms of post-traumatic stress disorder (PTSD). Results suggested that it was not necessarily trauma that predicted greater baseline use and increases in alcohol use, but it was the combination of trauma and PTSD that was most predictive of increased alcohol use. These findings highlight the importance of exploring the severity of trauma, and how substance use may unfold over time.

Sociodemographic Factors

Studies examining sociodemographic factors of those who have faced adversity have identified several variables that may elevate the risk of increased substance use. For example,

Haardörfer et al. (2021) found that predictors of baseline alcohol use included being White, higher SES, and living in a rural setting. Also, that a greater increase in alcohol use over time was predicted by participants being White vs Black. Binge drinking reports were also predicted by age (older participants being more likely to binge drink), living in rural settings, and higher SES. Adverse childhood experiences are far too common, especially among individuals living in certain geographic regions (e.g., Appalachia). Research has shown that adversity and alcohol use are both linked to many negative health outcomes across the lifespan. We also know that individuals who have experienced adversity are at a higher risk of using substances, especially alcohol. However, it is unclear if adversity affects the initial transition into college and alcohol use, as well as across time. Our study will focus on this trajectory to see the impact of childhood adversity on baseline and future alcohol use among college freshmen.

Theoretical Models of Adversity and Alcohol Use

While there is not one accepted guiding theory connecting adversity and alcohol use, there are several models utilized to understand why early adversity could result in increased alcohol use. One frequently utilized model is the "Self-Medication" hypothesis (Colder, 2001; Khantzian, 2003). Early adversity can disrupt an individual's ability to cope with prior, current, or even future negative life experiences (McLaughlin, Conron, Koenen, & Gilman, 2010). Some individuals may develop maladaptive coping behaviors, such as using substances like alcohol, tobacco, or illicit drugs to alleviate the negative symptoms of extreme stress, instead of using more effective coping strategies such as problem-focused coping (Anda et al., 2016; Haller & Chassin, 2018). Using alcohol may help individuals avoid aversive emotional reactions to prior events, or it may ease their ability to engage in social relationships.

In parallel with the self-medicating hypothesis, individuals exposed to early adversity often suffer from poorer impulse control (i.e., inability to inhibit behaviors), particularly around risky behaviors, such as substance use (Barch et al., 2013; Putnam, Harris, & Putnam, 2013). Literature has indicated that early life stress can alter brain structures and connections involved with stress response (Barch et al., 2013; Karssen et al., 2007). Blair & Raver (2012) explored how children who grow up facing economic hardship can struggle with self-regulation due to a number of factors, including genetics, quality of caregiving, stress hormones, neural connections, and other adverse experiences. Self-regulation is important for decision making (Blair & Raver, 2012), with those who have faced adversity more likely to engage in substance or alcohol use. Additionally, since those who are exposed to early adversity are likely to initiate substance use earlier in life (during a time of neural development), the damaging neurobiological consequence of such early use is closely tied to risky and impulsive behavior (Casey et al., 2010).

Familial modeling and genetic risk hypotheses also attempt to explain adversity-alcohol associations. Individuals who experience ACEs often have parents who abuse substances, including alcohol (Felitti et al., 1998). Social Learning Theory posits that individuals learn behaviors from watching those around them (Bandura, 1977). Seeing parents using substances, as well as parents' permissibility of using alcohol, can lead children to engage in higher amounts of alcohol use as adolescents and young adults (Abar et al., 2009). Lastly, specific genes are thought to be associated with an increased risk for alcohol use in youth and young adults. For example, Blomeyer et al. (2008) examined 384 children and adolescents from the Mannheim Study of Children at Risk to determine if their alcohol use was associated with a specific genotype. The researchers found that a carrier of a genetic variation in the gene *CRHR1* is related to negative life experiences and alcohol consumption among adolescents. Carriers of a specific

allele (C allele) over another (T allele) of this gene were found to drink alcohol more often and to

engage in heavy alcohol use when they were exposed to stressful life events, but the specific

genes did not predict increased alcohol use if lifetime stress was low l. These results suggest that

although genetics may be an important factor in understanding adversity-alcohol use

associations, it is the interaction of this adversity and genetics that is most important.

Overall, the goal of this current study is not to find definitive evidence of why adversity

is associated with alcohol use. Thus, we are not testing whether a specific theory is best. It is

likely that these theories presented above are not mutually exclusive, meaning that it is likely a

combination of these theories that will aid in explaining why early exposure may lead to

increased alcohol use.

Statement of the Problem

Childhood adversity can have numerous negative effects on health and the behaviors one

engages in (Anda et al., 2006). Specifically, compared to those with low levels of adversity,

individuals experiencing higher levels of early life adversity are more likely to drink alcohol at

younger ages (Anda et al., 1999; Dube et al., 2006; Dube et al., 2003), drink a greater quantity of

alcohol (Enoch, 2011; Rothman et al., 2008), and have more alcohol related problems (Rothman

et al., 2008). Since alcohol use changes over time, especially during critical periods such as the

transition to college (Carter, Brandon, & Goldman, 2010; Johnston et al., 2014), it is key to

explore longitudinal associations between early life adversity and alcohol consumption.

Identifying how early life adversity is associated with escalation in alcohol use is crucial to study

because of all the possible negative consequences of elevated alcohol use in the college setting

(e.g., injuries, physical and sexual assault, memory loss, suicide attempts and even death

(Johnston et al., 2014; Jones et al., 2010). Most importantly, escalation of alcohol use in college can be a time that sets a lifelong pattern of alcohol abuse (USADHHS, 2014).

Since alcohol use often begins in adolescence and early adulthood, the current study is well-suited to understand how early life adversity impacts alcohol use trajectories among first-time college freshmen. Specifically, we will examine how retrospective reports of adverse childhood experiences predict initial level of alcohol use prior to starting college, and whether there is an escalation of alcohol use over the first year of college.

Results of this study can be used to better understand the long-term effects of early life adversity on alcohol consumption patterns in a college sample already at risk for substance abuse. Identifying these patterns could be helpful in future prevention or intervention methods for children who have faced adversity, which is especially salient in this sample largely residing in the Appalachian region where adversities are among the highest in the nation (USADHHS, 2014; WV Health Statistics Center, 2019). Specifically, this research can inform more targeted alcohol use awareness programs for those who have faced higher levels of childhood adversity versus those who have not. Further, it can be used to intervene earlier than college or high school, when most individuals experiment with substances for the first time, to prevent such behaviors from even starting.

Research Questions

Research Question 1

Is there significant change in average alcohol use over the first year of college? It is hypothesized that individuals will have significant increases in alcohol use across the 4 assessments of the first year of college. Research has shown that college students typically increase the amount of alcohol that they consume across their first year of college (Cleveland et

al., 2012; Cyders et al., 2009; Johnston et al., 2014). In addition, we hypothesized that this change will be curvilinear, indicating that there will be increases followed by leveling off, similar to the results of Haardörfer and colleagues (2021).

Research Question 2

Is there variability in average intake of alcohol across the first year of college? In other words, are there different patterns of change among the participants (e.g., some are increasing at higher rates than others). It is hypothesized that there will be individual differences in change such that most individuals will increase in use, but that some will remain abstinent while others stay stable in lower alcohol intake (O'Malley & Johnston, 2002).

Research Question 3

Do any covariates predict variability in average initial alcohol intake or change in alcohol intake? It is hypothesized that those identifying as being White, male, older, and of higher SES will have higher rates of alcohol consumption and greater increases in use (Esser et al., 2017; Haardörfer et al., 2021).

Research Question 4

Does adversity predict variability in average initial alcohol intake or change in alcohol intake above any of the covariates? It is hypothesized that, over and above any effects of the covariates, individuals who have experienced higher rates of childhood adversity will begin college with higher rates of alcohol use than their peers and will show a significantly steeper increase in alcohol use compared to those experiencing lower levels of adversity. This could potentially be explained as a coping mechanism, as has been previously suggested (Rothman et al., 2008).

Method

Participants

The current study included 769 participants (M_{age} = 18.61 years, SD = 0.33, range = 18.09

– 20.11; 50.71% female; 90.25% White) who consented to the College Student Transition Study.

The study was completed entirely online through a large, public university in the Mid-Atlantic

United States from 07/31/19 through 05/31/2020. Participants were first-time freshmen, mostly

from the Appalachian region (42.45% WV), a region that is characterized by low socioeconomic

status and is at the epicenter of the opioid epidemic (Scholl et al., 2019; West Virginia

Department of Health and Human Resources, 2017). This sample is roughly characteristic of the

overall university class sample (51% female; 86% White; 51% from WV).

Although 769 participants completed consent and the baseline assessment, there was

dropout and nonresponse across the 3 other assessments as follows: 542 participants (69%)

completed wave 2 (from 10/24/19-11/08/19); 501 participants (64%) completed wave 3 (from

03/09/20-04/06/20), and 471 participants (60%) completed wave 4 (from 05/03/20-05/15/20). A

total of 155 participants (20%) dropped out immediately after completing baseline (non-response

to all follow-ups), 620 (80%) participants completed at least 2 waves of data, and 401 (52%)

participants completed all 4 waves of data. Since full information maximum likelihood (FIML)

procedures will be utilized in our analysis, all 769 participants will be included in our analysis.

Procedure

In June 2019, the University Office of Enrollment Management provided researchers

with a list of 4,329 incoming freshmen students and their email addresses. The goal was to

recruit 800 participants. A post-hoc power analysis was not conducted for purposes of this

proposed study based on suggestions not to conduct such post-hoc power analyses (Zhang et al.,

2019). Participants were excluded if they were transfer students (N = 17), or if they were not 18

years old as of August 1, 2019 or would be 21 years old prior to the end of data collection (N =

457). This resulted in a potential sample of 3,855 eligible students.

Next, the 3,855 eligible participants were split based on their academic index score

provided by the university. The score is based on high school grade point average (GPA) and

SAT/ACT scores, but the university does not provide exactly how the score is computed. Lower

numbers indicate higher academic risk (e.g., the student is more likely to have academic

problems, such as low GPA or to drop-out of college). Scores ranged from 66 (higher academic

risk) to 139 (lower academic risk). Students were split into two groups based on university

recommendations, high-risk (scores of 66 – 109, N = 1,845) and low-risk (scores of 110 – 138, N

= 2,010). In a computer randomizer, we randomly selected 400 names in the high-risk group and

emailed them about our study. After 1 week, one reminder email was sent. We then redrew a

second sample of 400 new names (without replacement) from the original 1,845 students for the

students who did not consent to the study. We emailed approximately 1,300 high-risks students

and had 331 consent to the study. This process was repeated for the low-risk group, but only

1,100 emails were sent and 443 consented to the study. Males in both the low- and high-risk

groups were oversampled based on pilot work (75% of pilot sample was female without the

oversampling methods used), as well as high-risk students overall. These randomization

procedures were done to ensure variability of low versus higher academically functioning

participants as well as a more equal gender breakdown of males and females.

All baseline data was captured via Qualtrics online survey prior to students arriving on

campus (July-August). The Qualtrics survey began with an introductory page that detailed the

basics of the study, followed by the consent document (Appendix B). Students had to manually

accept this invitation via a choice labeled "Yes, I willingly consent" to proceed. Next, participants filled out the baseline questions (Appendix C) taking on average 30 minutes to complete (range ~ 15-60 minutes). After completion, participants were welcomed to the study via email, and informed that they would be contacted to complete 3 additional assessments. Participants received the other 3 emails with Qualtrics links in late October 2019 (wave 2), March 2020 (wave 3), and May 2020 (wave 4). Multiple reminder emails were sent to complete each wave in order to reduce attrition rates After the final wave of data collection in May 2020, participants were paid electronically via an Amazon.com gift card. If they completed only baseline, they received $20; 2 waves completed = $30; 3 waves completed = $40; and all 4 waves completed = $50. Data was processed for completeness after each wave. The majority of participants who started each Qualtrics assessment completed it, but those who completed less than 25% of questions within each wave of assessment were removed from the data file and not compensated.

Ethical Considerations

This study was approved by the university's IRB and a Certificate of Confidentiality from the National Institutes of Health was obtained (Check, Wolf, Dame, & Beskow, 2014). A Certificate of Confidentiality adds an extra layer of confidentiality protection to participants as it further protects research participants' personal, identifiable information from those not connected to the study (e.g., University officials, campus police, etc.). This certificate can be used in a court of law to block the disclosure of participant reported information. This is important for a study such as this because of the intrusive information that we collected on participants.

First, participants were given information about the benefits and potential risks of completing the study. To continue with the survey, they had to give electronic consent (Appendix C). We ensured confidentiality of data as it may contain illegal behaviors (e.g., substance use) and very personal information regarding sexual behaviors, mental health, and childhood adversity. We ensured that once data was downloaded, a unique identification number was assigned to each participant that only the principal investigator could link in a password-protected file on a password-protected computer. All identifiable information was stripped from the survey data. In addition, since we did ask sensitive questions about childhood adversity, mental health, etc., we provided resources at the end of the survey (e.g., National Suicide Hotline, University Counseling Center) in case participants felt that they needed help.

Measures and Variables

Adverse Childhood Experiences

Within the broader College Student Transition Study, several different questionnaires were utilized to assess childhood adversity. Our intent for this project was to replicate (as close as possible) the original 10-item Adverse Childhood Experiences (ACEs) measure (Felitti et al., 1998). Typically, each question is a yes/no response format and each "yes" answer is added for a sum adversity score (0-10). Like others (Karatekin & Hill, 2019; Lee et al., 2018), we had modified the measure slightly to increase variability among responses by asking participants to use a rating scale format to determine how often each adverse experience occurred (e.g., 0 = "never true"; 1 = "rarely"; 2 = "sometimes true"; 3 = "often true"; 4 "very often true"). In our ACEs questionnaire (Appendix D), if a participant responded, "never true" to experiencing a situation, they were coded as a zero or "no". Anyone who responded, "rarely", "sometimes true", "often true", or "very often true" were coded as 1 or "yes" to having that adversity. Additionally,

some questions had sub-parts (e.g., "Did a parent or other adult in the household ever act in a way that made you feel afraid that you might be physically hurt?"). Because some questions had subparts, if a participant responded affirmative to either the primary or subpart question, they were coded as having experienced that adversity. Note, in Appendix D we numbered each question such that any question with the same number represented one multi-part question from the original ACEs measure. We summed each of the responses to create an adversity variable that ranged from 0 (none of the 10 adversities) to 10 (all of the adversities) to make our findings directly comparable to the plethora of other studies using the classic ACEs measure. Our analyses were calculated using the sum ACE score of participants.

Alcohol Use

To examine change in alcohol use, we utilized a variable that indexed average alcohol consumption (Appendix E). First, participants were given the stem "The next set of questions are about your alcohol use. This includes coolers; beer; wine; champagne; liquor such as whiskey, rum, gin, vodka, bourbon, tequila, scotch, brandy, cognac, or liqueurs; and also, any other type of alcohol.". Then they were asked, "Have you ever had more than a few sips of beer, wine, or any drink containing alcohol? If you only had a sip or two from a drink (e.g., from a parent) select "NO". Responses were coded such that those who reported never drinking alcohol were coded 0 and those who had confirmed drinking alcohol were coded as 1. Those who reported drinking were asked follow-up questions about average use. Specifically, participants were asked, "In the past 30 days, how many alcoholic drinks did you have on a typical day when you drank alcohol?". Any participant who had originally stated they did not drink were coded a 0 on the average drinks variable so they would still be included in the analysis. This same procedure was done at each of the 3 additional assessments, so we had 4 reports of average alcohol use.

Covariates

Age, gender, race, and perceived socioeconomic status were included as covariates (Appendix C), as they have known associations with both adversity and alcohol use (Doom et al., 2014; Raposa et al., 2014; Rudolph & Flynn, 2007; Umberson et al., 2014; Van Oers et al., 1999). Date of birth was provided by the university so that participants' exact age in years with decimals was calculated. For gender, participants were asked, "Please indicate the gender that you identify with". Gender was coded as female = 0, male = 1, or other = 2. Those who selected "other" were asked to specify their gender. Due to a small sample size of those who did not report male or female (N = 6), these individuals were removed from data analyses. For race, participants were asked, "Please indicate your race". To simplify analyses due to uneven groups, race was coded 0 = White/Caucasian, 1 = minority status (i.e., American Indian/Alaskan Native, Black or African American, Mixed, Unknown, or Other). Socioeconomic status was measured with the MacArthur Scale of Subjective Social Status (Adler et al., 2000) where participants were asked "Imagine that this ladder shows how your society is set up. At the top of the ladder are the people who are the best off - they have the most money, the highest amount of schooling, and the jobs that bring the most respect. At the bottom are people who are the worst off - they have the least money, little or no education, no jobs or jobs that no one wants or respects. Now think about your family. Please tell us where you think your family would be on this ladder. Select the number of the rung that best represents where your family would be on this ladder."

Analyses

Preliminary Analyses

Data Management and Cleaning

All Qualtrics survey responses were downloaded to SPSS and SAS for data analysis. Although we utilized FIML, we still tested missingness using Little's Missing Completely at Random (MCAR) test. We found that the test was significant (*Chi-Square* = 111.79; *p* = .001), indicating that our data was not MCAR. Next, we constructed a binary missingness variable that indicated whether a participant has full data (N = 387) versus incomplete data (N = 388). Using baseline data, we utilized chi square tests and independent samples t-tests to compare those with full versus missing data. We found those who had missing data were more likely to report higher average alcohol use at wave 1 (M_{full} = 1.64; $M_{incomplete}$ = 2.27; $t(767)$ = -3.22, $p < .001$) and wave 2 (M_{full} = 2.30; $M_{incomplete}$ = 3.66; ($t(532)$ = -4.45, $p < .001$). Additionally, those who had missing data were more likely to be male, X^2 (1, N = 769) = 35.39, $p < .0001$. There were no differences in attrition based on age, race, SES, adversity score, or wave 3-4 alcohol use.

Univariate Checks. Univariate tests were examined to test for issues with skew, kurtosis, or outliers. There were no concern able issues with skewness or kurtosis other than slight skewness and kurtosis for alcohol use at all four waves because of the excess zeros (i.e., non-drinkers). However, based on relaxed assumptions of normality when using growth curve modeling, we did not transform these variables. At Wave 3, there was one individual who reported consuming 20 drinks on average and a different individual at Wave 4 reported consuming 30 drinks. These outliers were windsorized at 15 to normalize the data more.

Bivariate Checks. Pearson's correlation coefficient were calculated for childhood adversity and the outcome variable (i.e., alcohol use) at each wave to test for initial linear associations. There were no significant correlations between childhood adversity and W1 alcohol use (r = .015), W2 alcohol use (r = .060), W3 alcohol use (r = .069), or W4 alcohol use (r = -.020). To check for heteroscedasticity, simple scatter plots were estimated of childhood adversity

and each wave of alcohol use. Visual analysis of the plots helped to determine that the data did

not appear normal, and that assumption of heteroscedasticity was not maintained. This was likely

due to an excess of zeros (i.e., non-drinkers) in the sample.

       Multivariate Checks. Multivariate outliers were checked using Mahalanobis distance,

Cook's D, and leverage values to determine if a data point exerted an undue influence on the

regression line. There was one identified data point/multivariate outlier. Normality of the

residuals were checked using a P-P plot and histogram which appeared normal and did not

violate our assumptions. Lastly, multicollinearity was assessed using tolerance values, variance-

inflation factor (VIF), and condition indices (CI). Based on the outcomes of these tests, a form of

statistical correction (e.g., centering) was not needed, as all tolerance values were greater than

.20 and VIF values were less than 4.0.

Primary Data Analyses

       Latent growth curve models were estimated in Mplus version 8.4 (Muthén & Muthén,

2017) to examine mean level changes in alcohol use across the 4 waves of data. Importantly, this

method allowed us to test whether there is variability among participants in initial level of

average alcohol use, mean level changes in alcohol use, and whether demographics/childhood

adversity would predict this variability in initial level or change. FIML was used to enable the

inclusion of all data. The first step in this analysis was to estimate an unconditional growth

model of average alcohol use. This allowed us to estimate the average baseline level of alcohol

use (intercept) and the average change in alcohol use over the 4 assessments (slope). The model

provided a significance test of whether the intercept or slope are significantly different than zero

using an alpha of .05. Since we had 4 waves of data, we could also test whether a curvilinear

change pattern (quadratic) fit the data better than a linear model. If the quadratic term was

statistically significant, then we retained a quadratic change model for the remainder of analyses. This initial unconditional model also let us test whether there was variability in the intercept or slope, meaning do individuals differ in their initial alcohol use prior to college, and do individuals change differently in their alcohol use over the first year in school. The results of these unconditional models address research questions 1-2.

If the unconditional growth model showed that there is statistically significant variability in baseline alcohol use (intercept) or variability in alcohol use change (slope), we then estimated a conditional growth curve model where we introduced covariates and our focal predictor (childhood adversity) in an attempt to significantly predict this variability (addressing research questions 3-4). In the first model, we included all of the covariates as predictors of the intercept and slope. In a second model, we also added childhood adversity. Fit of each model was evaluated by the Chi Square, comparative fit index (CFI), and root mean square error of approximation (RMSEA). Acceptable model fit values are represented by lower Chi Square value, A CFI over .90 and RMSEA under .06 (Hu & Bentler, 1999; Kline, 2015).

Results

Descriptive statistics for our main variables can be found in Table 1. For our main analyses, we first estimated an unconditional model with four waves of alcohol use entered into the model. Estimates can be found in Table 2. Since the model fit for the linear model was less than adequate, we re-ran the model with a quadratic effect. Model fit was improved in terms of a non-significant Chi Square and improved CFI and RMSEA, and thus deemed acceptable when quadratic growth was specified (Hu & Bentler, 1999; Kline, 2015). Figure 1 displays the mean quadratic change in alcohol use levels. At baseline (July-August 2019), the average participant consumed approximately 2 alcoholic beverages (intercept = 1.96). After the baseline assessment

prior to college, alcohol use levels significantly increased over time approximately 1 alcoholic

drink (slope = 1.18) until wave 2 (October-November 2019). The quadratic effect was evidenced

by a significant slight decrease in alcohol use from waves 2 to 3 (March-April 2020) and a more

substantial reduction from waves 3 to wave 4 (May 2020). Examination of the random effects

revealed that there was significant variability in intercept (i.e., alcohol use level prior to starting

college), slope (i.e., how much individuals changed in alcohol use over time), and quadratic

effects (i.e., differences in curvature). In addition, there was a significant covariance between

intercept and slope (b = -0.39; p = .001) suggesting that the greater the baseline level of alcohol

use, the steeper they decreased over time. There was not a significant covariance between the

slope and quadratic effect.

Table 3 displays the conditional latent growth model to determine if adversity predicted

variability in the intercept, slope, and quadratic change in alcohol use scores – net of key

demographic variables. First, we estimated a model that included just the covariates (Model 1).

Model fit was acceptable. Being male and older in age significantly predicted higher levels of

alcohol use at baseline (i.e., intercept), in line with our hypotheses. Being older at baseline was

significantly associated with less of an increase of alcohol use across time (i.e., slope) although

still an increase. None of the demographic variables significantly predicted curvature in alcohol

use change across time (i.e., quadratic change). Our next model (Model 2) added adversity as a

predictor. Higher levels of adversity did not significantly predict the intercept or slope[1], but

adversity did predict variability in the quadratic effect. Figure 2 displays the overall findings.

Compared to those not having any adversities, those scoring a standard deviation above the mean

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[1]Effects of adversity on the intercept and slope were in the expected direction (i.e., greater
adversity was associated with higher baseline levels and steeper increases in alcohol use) but the
associated p-values were .08 and .10, respectively.

started out with slightly higher levels of alcohol use (not statistically significant), showed a similar increase in alcohol use from baseline to wave 2, showed a similar decrease in alcohol use from wave 2 to wave 3, but had a steeper decrease in alcohol use from waves 3 to wave 4.

Sensitivity Analyses

Due to the COVID-19 Pandemic interrupting wave 3 data, we ran several analyses to examine if and how the pandemic affected results. At the university where the study was conducted, students were instructed to vacate the dorms by March 13th, 2020, as Spring Break was originally March 14-23 and extended to March 30th. We wanted to know if the timing of when participants were required to leave the dorms would allow us enough variability to test if there were differences in alcohol use at wave 3. We thus created a binary variable of participants who completed wave 3 prior to March 13th (coded as 0; 74%) and those who completed it March 14th or later (coded as 1; 26%). Mean alcohol use did not differ between those who moved out prior ($M = 2.39$, $SD = 3.07$) vs after March 14th ($M = 1.86$, $SD = 2.53$), $t(499) = 1.76$, $p = .08$. Next, we examined whether there were differences in the percentage of participants who were non-drinkers among those who moved out prior versus after March 14th, but we found no differences, $X^2 (1, N = 490) = .009$, $p = .923$. Thus, we determined that the moving process from dorms to home due to the beginning of quarantine did not disrupt our analyses.

Additionally, we ran multiple analyses to determine how alcohol use changed from waves 3-4. We compared participants at waves 3 and 4 to understand if there was a mean difference in alcohol use. There was a significant mean decrease of 1.01 in number of drinks consumed between wave 3 and wave 4, $t(427) = 6.86$, $p < .0001$. Next, we investigated whether there was a difference in percentage of participants who were non-drinkers in wave 3 compared to wave 4 and found more non-drinkers reported in wave 4, $X^2 (1, N = 423) = 111.23$, $p < .0001$.

We also tested whether rates of binge drinking and pregaming changed from wave 3 to wave 4 and found that both significantly decreased across time, $t(342) = 7.03$, $p < .0001$, and $t(422) = 13.30$, $p < .0001$, respectively. Thus, we are confident that our pattern of average alcohol consumption significantly decreasing from wave 3-4 is reflected in other alcohol use variables as well.

Further analyses were run to examine where participants were living at wave 4, with most (96.17%) reporting living back with their family/parents. This is complemented by our analyses indicating most participants (20.25%) reported drinking at wave 3 at off-campus residences/friend's house compared to most participants (36.62%) reported drinking at wave 4 at their own house/parent's house.

We wanted to further examine non-drinkers in the current sample. In a first step, we explored whether adversity predicted whether someone was a non-drinker versus a drinker at baseline. Logistic regression analyses controlling for all other demographic factors found that adversity did predict the odds of using or not using alcohol at baseline ($OR = 1.085$. 95% $CI = 1.007$-1.168; $p = 0.03$). In a second step, we created a binary variable to indicate whether someone reported never drinking across all 4 waves (N = 262) versus those that reported at least some alcohol use (N = 513). We removed the 262 individuals from the data set and re-ran the unconditional and conditional latent growth models to determine if these non-drinkers affected findings. The intercept (3.53) and slope (-0.203) parameters were all stronger (e.g., greater alcohol use at baseline and greater increases over time) because all of the reported zeros on alcohol use variables were excluded from the study. However, none of the other findings were appreciably different with this reduced sample of only those that reported drinking over freshman year.

Lastly, we estimated conditional growth models with each individual ACE item in a separate model (Appendix F). We found that items 1 ("if an adult ever pushed/grabbed/slapped/threw something at them OR ever hit so hard it left marks") and 2 ("if an adult ever swore at/insulted/humiliated them OR made them feel afraid they might be physically hurt") were significant predictors of a positive intercept/baseline. Also, items 4 ("adult ever touched/fondled them OR ever attempted to/actually had oral, anal, or vaginal intercourse with them") and 7 ("a household member was depressed/mentally ill OR attempted suicide") were significant predictors of positive slope and a steeper decrease in curvature. We then put each item into the same model to see the unique predictive power of specific types of ACES (Appendix G). We found that none of the ACEs significantly predicted intercept, slope, or curvature.

Discussion

The first goal of the current study was to explore how alcohol use changed over the first year of college in a sample of first-time freshmen. Analyses indicated that, on average, participants reported consuming approximately 2 alcoholic beverages during the time directly preceding their start of college, alcohol consumption then increased during the first 2 months of college by about 1.5 of drinks, but then decreased by about 0.5 drinks (from baseline) by the end of their freshman year. Importantly, there was significant variability in how much alcohol was consumed at baseline (intercept), change over time (slope), and the curvature of change over time (quadratic). The second goal of this study was to determine whether retrospectively reported childhood adversity would predict initial levels of alcohol consumption or changes in alcohol consumption over time. Interestingly, childhood adversity did not significantly predict differences in baseline consumption, or initial changes in alcohol use in the first few months of

college, but it did predict variability in curvature across time (quadratic). Specifically, those who reported higher levels of childhood adversity at baseline had a steeper decrease in average alcohol use during the spring semester of their first year. Although our hypotheses were only partially supported in the current study, the long-standing effects of childhood adversity are still prevalent and worthy of investigation.

Prevalence of Alcohol Use and Adverse Experiences

Comparing the alcohol use and alcohol trajectories we found in our study to previous work suggests there are several similarities yet subtle differences. First, our estimate of 47% of the sample reporting drinking alcohol at least once in the past 30 days (the period of 30 days right before the start of college) is on the lower end of various estimates suggesting that anywhere between 40-64% of college students in this age-range are currently drinking alcohol (Del Boca et al., 2004; Lipari & Jean-Francois, 2016; Patrick et al., 2014; SAMSHA, 2019). When examining the average level of consumption of baseline, our sample reported an average of 1.95 drinks ($SD = 2.74$) at baseline. This is somewhat lower than previous reports of college freshmen reporting between 2.91 and 3.43 (Prince et al., 2019) or 2.6 drinks per occasion (Fazzino et al., 2019). Lastly, our study confirms that there is an initial increase in average alcohol use during the immediate transition to college (Abar et al., 2019; Capone et al., 2007). Although we also found a curvilinear effect like Del Boca and colleagues (2004), our sample did not just show a slight decrease and stabling of use. Rather, we found a very sharp decrease in alcohol during the spring semester. As will be discussed later, one of the main reasons we believe this pattern was so different from prior work is because of the COVID-19 pandemic that forced students to leave campus during the latter part of the spring semester. Overall, our alcohol trajectories are similar to prior work albeit slightly lower. The lower number of drinkers and

fewer number of alcoholic drinks consumed might be related to the timing of measurements because most baseline assessments of college freshman in prior work have measured such indices when students have already moved onto campus. Thus, it is likely that students were already starting to increase their use which is normative when college students leave the home and start experimenting with alcohol in less supervised settings.

Evaluating the prevalence of adversity reported in our sample reveals just how common adversity might be in certain regions. In the current study, 84.52% reported experiencing at least one adversity prior to age 18, which is higher than the suggestion that about half of all children will experience adversity at some point (McLaughlin et al., 2013). It also is supported by the reporting of higher levels of ACEs in the Appalachia region where the majority of participants from this study resided prior to going to college (USADHHS, 2014; WV Health Statistics Center, 2019). On average, our participants reported experiencing 2.66 adversities out of 10 with the most frequently reported adversities (69% of the sample) being the two sets of questions related to emotional abuse (e.g., "an adult ever swore at them, insulted them, put them down, or humiliated them OR acted in a way that made them feel afraid they might be physically hurt"; and if they "ever felt that no one in family loved them or thought they were important or special OR that their family didn't look out for each other, feel close to each other, or support each other". While Felitti et al.'s (1998) original sample ($M_{age} = 56.1$) was quite different than the current sample of college students, the measure of adversity was identical and 67% of participants in that study reported at least 1 ACE, with the most frequently reported ACE being "exposed substance abuse in the household" (18.60% of the sample in our current study). Other samples of college students report similar prevalence estimates such as a study of 216 incoming freshman that reported 71.8% experienced at least one ACE, with an average report of 1.80

ACEs (Filipkowski et al., 2016). Another study of 2,969 college students from 7 universities

found that 53.2% of students reported experiencing at least one ACE (Windle et al., 2018). Thus,

although slightly higher in our sample, prevalence estimates are roughly similar to other studies

of college students lending some confidence that our participants were accurate in their reporting

of adversities.

Adversity and Alcohol Use Trajectories

Overall, our prospective investigation did not find that prior adversity predicted baseline

levels or a difference in rates of initial change in alcohol use. This lack of findings is surprising

given the available evidence that individuals exposed to childhood adversity may use alcohol or

other substances as a coping mechanism (Anda et al., 2016; Colder, 2001; Haller & Chassin,

2018; Khantzian, 2003; Rice & Van Arsdale, 2010). Due to this, we expected to find adversity

significantly predictive of participant baseline alcohol use. However, our study indicates that

adversity was not associated with baseline alcohol use. Those reporting higher levels of adversity

reported drinking about 1 alcohol drink more at baseline than those who did not experience

childhood adversity, but that difference was not found to be statistically significant ($p = .10$). To

further probe this difference in baseline alcohol use, we conducted a post hoc logistic regression

analysis to determine if higher levels of adversity were associated with an increased odds of

being a drinker (compared to those who reported being a non-drinker at baseline). We found that

higher adversity was significantly associated with an increased odds of reported drinking in the

past 30-days at baseline. It is interesting that we found an effect of adversity on whether or not

someone used alcohol at baseline, but there was no difference in the amount of use. Perhaps this

is due to a lack of variability in average use among students right before they start college. More

research is needed to explore alcohol use trajectories before the college transition when

experimentation likely first starts in late adolescence.

Although there was variability in alcohol use across time, higher adversity did not predict

an increased use of alcohol over time in the current study. There was a slightly steeper slope for

those reporting higher adversity during the initial transition to college, but this difference was not

statistically significant by traditional standards ($p = .08$). Prior work has shown that adversity

predicts increased use of alcohol over the freshman year (Berenz et al., 2017; Espeleta et al.,

2018; Lee & Feng, 2021), but there are also other studies that do not show such increases

(Graupensperger et al., 2021; Haardörfer et al., 2021). Our lack of a finding might be because of

our limited measurement points since prior work has suggested that although alcohol use does

increase over the freshman year, it is quite variable week to week (Del Boca et al., 2004).

Meaning, to get an accurate estimating of alcohol use, there needs to be very strategic

measurement occasions (e.g., use around breaks, holidays). Since our measurement windows

were open for approximately 2 weeks, there may have been differences in reporting due to the

timing of when participants actually filled out the questionnaire. Future research would benefit

from daily diary approaches that could better capture fluctuations in alcohol use.

Higher levels of adversity in the current study did significantly predict a steeper decrease

in alcohol use during the spring semester for participants (the curvature represented by the

quadratic term). As seen in Figure 2, the slope for average alcohol use among those with higher

adversity has a sharp decrease, whereas the decrease among those with average or no adversity

was somewhat negligible. This could be explained by those with higher levels of adversity

having slightly higher baseline alcohol use and thus having more ability to decrease use (i.e.,

regression to the mean). An example of this was found in a study of 997 freshmen by Read et al.

(2012) on posttraumatic stress disorder (PTSD) symptoms and alcohol use trajectories across the

first year of college. Participants who reported higher levels of PTSD began the year with more

alcohol problems and also decreased at a steeper rate compared to participants who did not report

as high of PTSD levels.

Another possible explanation for the sharp decrease in alcohol use among those reporting

high levels of adversity at baseline could be related to the timing of the COVID-19 pandemic.

Although prior work has shown slight decreases in alcohol use during the freshman year

(Haardörfer et al., 2021), no study showed such a steep decrease that we found in our sample.

The current sample is from cohort 2 of a larger parent study on the college transition, so we have

the benefit of comparing alcohol trajectories to cohort 1 that was collected in non-COVID times

during the 2016-17 academic year. Findings were similar in terms of baseline amount and

increase over time, but what differed was that end of the year decrease. In the 2016-17 sample,

there was just a slight decrease in alcohol consumption. Thus, the steeper decrease in the current

sample may be a result of students having to leave campus due to COVID-19 related restrictions

set forth by the University. While at home, there were likely increased parental restrictions on

alcohol use or even a lack of access to alcohol. To explore some of these possibilities we

conducted a series of sensitivity analyses with additional variables available in the parent study.

First, since completion of Wave 3 drinking behaviors occurred during the time when the

University required students to leave the dorms (90.57% of our sample lived in the

dorms/student housing), some participants had completed the questionnaire prior to leaving

campus (N = 371) while the remainder completed it after (N = 130). This means that the reported

average alcohol use could be influenced by some individuals reporting use while still living in

the dorms while some had already moved home with parents. We conducted a Chi-Square

analysis to determine if there was a greater proportion of non-drinkers that completed the wave 3 survey before or after leaving the dorms but there was no significant difference. We also estimated an independent samples t-test to determine if average drinks consumed differed depending on the timing of when wave 3 was completed but there was no difference. Thus, we can conclude that when participants completed the wave 3 survey in response to COVID-19 dorm closures likely did not influence our findings.

We also wanted to further probe the strong decline in alcohol use between waves 3 and 4 in the spring semester. First, we tested whether the wave 4 alcohol use prevalence could have impacted the growth curve models we chose. Thus, we dropped the fourth wave and tested an unconditional growth model with just the first three waves of data (see Table 2). Model fit was far inferior than the quadratic model we obtained with the full four waves of data so we were confident that including all waves was the correct decision. Second, we tested whether rates of binge drinking and pregaming changed from wave 3 to wave 4 and found that both significantly decreased across time,. This is logical based on this spring semester living arrangements with most participants (96.17%) reporting that they moved back in with their family/parents after the University imposed the dorm closures. Recent investigations into how COVID-19 has impacted alcohol use in college suggests that decreases in use might be a universal phenomenon (Graupensperger et al., 2021) but it is not clear as to whether that is because access has decreased (e.g., lack of ability to obtain alcohol), supervision increased (e.g., moving away from campus to live with family and thus more restrictive rules), or the disruption in socialization (e.g., social distancing mandates) are the reasons behind this decrease in alcohol consumption. One way we hoped to understand this is through an open-ended question that participants answered about their contentment with their living situation during wave 4. The open-ended responses were

roughly tabulated to determine if participants were making comments about their inability to obtain alcohol or having restrictive home environments. The most common responses contained words such as *freedom*, *privacy*, *friends*, *rules*, etc. We expected that some participants would be frustrated with the inability to drink alcohol or as much alcohol, but terms such as *alcohol* or *drink* were never reported. Most participants (18.79%) reported frustration with a lack of independence/freedom to do what they want and see who they want whenever they wanted, and 12.4% reported missing their friends and the social aspects college granted them. From these answers, we can speculate that although participants did not mention the lack of alcohol use as a primary concern about moving back with their parents, their reported inability to make their own choices on their schedule and lack of contact with college friends could be responsible for the decrease in alcohol use.

Limitations & Future Directions

Although the current study had many strengths, there are qualifications that must be discussed. First, we choose to reconstruct the classic ACEs measure (Felitti et al., 1998) because this is one of the most common measures used to capture early adverse events. However, there has been recent criticism that although this measure is easily and widely administered for screening purposes in clinical settings, it only captures a narrow picture of early adversity (McLennan et al., 2020). Future studies should include broader measures of adversity because experiences such as living in poverty, experiencing bullying, or community violence exposure, have all been shown to be associated with increases in substance use (Cerdá et al., 2010; Löfving-Gupta et al., 2018; Pollitt et al., 2018). Another critique of the original study involves question 7 which asks participants whether their "mother or stepmother was often or very often pushed, grabbed, slapped, or had something thrown at her? or Sometimes, often, or very often

kicked, bitten, hit with a fist, or hit with something hard? <u>or</u> Ever repeatedly hit over at least a

few minutes or threatened with a gun or knife?". This question does not consider violence

towards a father/stepfather or other non-binary guardian in the household and could thus be

missing key negative experiences.

Also, since most studies quantify adversity as either happening or not (like we

operationalized in the current study), more precise information about the severity of the

experienced adversity is missing. For example, measures that capture how much adversities

impacted them and/or how often the adversity occurred can be an important predictor of how

detrimental that adversity is to them over their life span (McLennan et al., 2020). Additionally,

by using sum scores to assess ACEs impact on individuals, it can be missed if there are some

adversities more detrimental than others. For example, Schilling et al. (2007) reported that sexual

or physical abuse as often being more severe than other adversities (e.g., having divorced

parents). The severity is not considered in measures such as ours when a sum score approach is

used, and thus future research should examine specific types of adversity. As a sensitivity

analysis we separated all 10 adversities and tested each one individually. Mirroring this prior

research, we found that physical, psychological, and sexual abuse were all stronger predictors of

alcohol use than other adversities (e.g., parents were single/separated/divorced, household

member went to prison). However, once we included all 10 items in the same model, not one of

them predicted unique variance in intercept, slope, or the quadratic effect. This is most likely due

to multicollinearity because there is obvious overlap between seem of these types of adversities.

Future research needs to utilize factor analytic procedures to ensure the combination of ACEs

used in a study are appropriate.

Another common critique of all adversity measures is that retrospective reports can contain a lot of bias or error. However, there is some argument that even though retrospective reports can be biased, perceived experience of these adverse events should still be trusted (Hardt & Rutter, 2004). Moreover, since our sample was mostly 18, we are somewhat more confident that their reports of any adversities prior to age 18 are less biased compared to studies that obtain retrospective reports of adversity in samples in adulthood when much more time has passed since the adversity was experienced. We are still limited though, because our measure did not ask participants to report when exactly an experience occurred. This is important information to capture as adversities occurring earlier in life (especially during critical periods of development) can have worse outcomes on individuals than later in life (Dunn et al., 2019; Hambrick et al., 2019; Nelson & Gabard-Durnam, 2020). Future studies should incorporate a more inclusive childhood adversity measure that addresses these concerns.

A second main concern is how alcohol use was quantified for the current study. First, we only examined the number of average drinks on a drinking occasion within the past 30-day time frame. This could underestimate the true level of drinking because prior work has shown that alcohol consumption is quite variable over time and more frequently repeated measures should be employed (Del Boca, et al., 2004). Prior work has suggested that measures that capture the number of total weekly drinks (Hustad et al., 2009) or total monthly drinks (multiplying typical quantity by typical frequency per week; Read et al., 2012) might be better indicators of past alcohol use. One of the gold standards for accessing alcohol intake is the timeline follow-back method where alcohol use for every single day in the past 30-days is assessed (Del Boca et al., 2004). The tradeoff of this method is that trained interviewers must record these responses and it can be very time intensive to complete in a longitudinal study with a large N like our sample.

Moreover, average use does not necessarily capture binge drinking rates or alcohol related problems (e.g., drunk driving, physical altercations when drinking). Prior work has suggested that such measures could provide more detail on more problematic drinking that can predict worse outcomes among college students (Arria et al., 2008; Baliunas et al., 2010; Wolaver, 2002). Also, any alcohol measurement could be biased because it is retrospective, and students could have inaccurately reported their alcohol use. It is possible that students could have incorrectly reported their drinking due to possible legal ramifications of drinking under age 21, despite our disclosure that we will not use the data in that way. Based on the variability of our sample's drinking behavior, we do not believe this to be an issue but there is no way to statistically test for this possible error of measurement. And although we provided what a standard drink consist of, participants might not be able to accurately describe what a standard drink is (e.g., reporting 1 mixed drink as a standard drink when it actually contains 3 shots of liquor thus should actually be considered 3 standard drinks). Studies interested in college alcohol use should examine alcohol use more holistically to ensure a complete understanding of alcohol behaviors and motivations.

Another limitation of our study has to do with the representativeness of our sample. First, this sample was restricted to first time freshmen at one university and within a specific age range. Participants were excluded if they were transfer students or if they were not 18 years old at the time of the baseline assessment. This inclusion/exclusion criteria was based on IRB recommendations to only include participants over 18 due to the sensitivity of questions included in the study (e.g., substance use and adversity). We also would have been unable to easily obtain parental assent for those under 18 since the time frame of recruitment was so short (less than 1 month). We also excluded anyone that would have been 21 years of age by the end of data

collection because we wanted to ensure we were studying alcohol use in a sample for which

drinking was illegal behavior. And even though our sample was roughly representative of the full

freshman class at the University, we did have somewhat select drop-out with those with

incomplete data being more likely to be male and drinking more alcohol at waves 1 and 2. This

is not surprising since males typically drink more, but the fact remains that those we might be

interested in most might not remain in the study. Regardless, FIML attempts to account for this

missing data.

Our findings are also limited in generalizability because although our main research

questions were framed to answer questions about the specific transition period into college, there

are many individuals who do not go to college and thus are not included in our sample. Our

sample is restricted to those who do not go to college might be uniquely different than those who

do. For example, those exposed to higher levels of childhood adversity are less likely to graduate

high school or attend college (Boden et al., 2007). Likewise, those who are heavy abusers of

alcohol in high school are also at a decreased risk of attending college (O'Malley & Johnston,

2002). Thus, the individuals we care about most, those with higher levels of adversity or those

with high levels of pre-college alcohol use (or both) might not even be included in our sample

because they never attended college. Future work would benefit from recruiting high school

seniors to not only assess alcohol use earlier in emerging adulthood, but also to understand how

adversity and alcohol use impact the decision to attend college.

Even though we utilized an advanced and sensitive statical tool in latent growth curve

modeling for the current study, there may be other statistical procedures that could better model

alcohol use. Latent growth curve modeling is beneficial because of the flexibility of

incorporating missing data via FIML and having somewhat relaxed statistical assumptions that

must be met. This is why previous studies examining alcohol trajectories in college have largely

utilized this technique (Del Boca et al., 2004; Fazzino et al., 2019; Griffin et al., 2013). Although

our model fit was more than acceptable, some researchers would consider alcohol use a count

variable, not a continuous variable like we treated it. Moreover, since there were a lot of non-

drinkers included across each wave, their average alcohol consumption would be zero. This

would downwardly impact average drinking rates. Some researchers have called to utilize zero-

inflated Poisson (ZIP) models within a latent growth curve framework (Lie, 2007). However,

these models are still in their infancy and there are a lack of details in the field as how to estimate

and interpret such models. Regardless, we attempted to run these models in Mplus, but they

would not converge successfully. To further probe the issue of the elevated number of non-

drinkers in the sample, we dropped any participant (N = 262) who did not report any alcohol use

across the 4 waves. The intercept and slope parameters were all stronger (e.g., greater alcohol

use at baseline and greater increases over time) because all of the non-drinkers were excluded

from the study. Even though we reduced our sample size considerably, the adversity findings

predicting alcohol use were nearly identical. Future work would benefit from comparing

traditional growth curve modeling to ZIP models, as well as utilizing latent transition analysis to

understand how individuals might transition from non-drinker to drinker over time.

     Lastly, the COVID-19 pandemic definitely interrupted our final two waves of data

collection in Spring 2020. To account for this disruption, we ran several sensitivity analyses, but

there is still a concern that COVID-19 could have differentially impacted how participants

reported their alcohol use. Future studies need to examine the impact that the COVID-19

pandemic has had on college students, especially freshmen, regarding substance use behaviors

and mental health. For example, Graupensperger et al. (2021)'s findings about perceptions of

even distanced peers influencing alcohol use highlight the importance of addressing drinking

behaviors of those who may increase but also those who decrease in stressful situations, such as

a pandemic.

Implications

Adversity can have negative long-term implications for health and behavior (Anda et al.,

2006; Pretty et al., 2013; Su et al., 2016). What is key is identifying sensitive periods across the

lifespan when the negative effects of adversity are likely to impact development and coping

behaviors. Young adulthood is one such age-period when many individuals leave the home and

are at an increased risk of substance use (Schulenberg et al., 2020; Skidmore et al., 2016). By

identifying individuals with higher levels of experienced adversity, prevention efforts might be

better targeted to those individuals who may be at a higher risk of behavioral problems such as

alcohol or drug abuse. Thus, resources can be diverted to those who need it most. It will also be

important to understand how adversity can impact those already at high risk of increased alcohol

consumption such as those who are a part of Greek life (Capone et al., 2007). Universities and

colleges can target these pledges and recruits with alcohol use awareness information (e.g.,

safety tips, alcohol poisoning warning signs, etc.) prior to college and during the first year as this

is when rushing may occur and the increased likelihood for alcohol abuse.

Our study's findings can also be used to inform alcohol use awareness programs for those

who have faced higher levels of childhood adversity. Since adversity has been linked to other

mental and physical health issues across the life span (Karatekin, 2017; Luby et al., 2017;

Mersky et al., 2013; Schilling et al., 2007), these health concerns can consequently interfere with

the entire college experience (e.g., learning, socializing). Recognizing those who enter college

having faced childhood adversity can allow administrators or educators to prioritize resources for

these students to assist in academics (e.g., tutoring) or treatment (e.g., counseling). Such

successful alcohol awareness programs already exist such as the widely used Alcohol-EDU

program (Hustad et al., 2010), but individuals with adversity might need more tailored

interventions to assist with mental health and behavioral choices. Moreover, such electronic

interventions, although initially successful at reducing alcohol intake and related problems,

appear to not work over longer periods of time (Carey et al., 2011). Clearly, more research is

needed to determine which interventions will work best for those exposed to adversity and

addressing just substance use might not be worthwhile unless other symptoms such as depression

and poor coping skills stemming from the adversity are addressed.

In summary, early life adversity is prevalent in college populations and will likely only

get worse with the opioid epidemic and COVID-19 pandemic continuing to plague the nation.

Although there are ideas of how to prevent early life adversity, the fact remains that there is no

way to fully stop it. Thus, there needs to be accurate assessments of who experiences adversity,

as well as tailored interventions to address the negative effects associated with early adversity.

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Table 1

Descriptive Statistics of Main Variables

Variables	Percentage	Mean	SD	Minimum	Maximum
Age		18.61	0.33	18.09	20.11
Gender (1 = male)	49.67			0	1
Race (1 = POC)	9.75			0	1
SES Ladder		6.56	1.51	1	10
ACEs		2.66	2.13	0	10
W1 drink status (1 = drinker)	47.28			0	1
W2 drink status (1 = drinker)	57.88			0	1
W3 drink status (1 = drinker)	56.33			0	1
W4 drink status (1 = drinker)	41.58			0	1
W1 30 avg. drink		1.95	2.74	0	15
W2 30 avg. drink		2.67	3.22	0	15
W3 30 avg. drink		2.25	2.95	0	15
W4 30 avg. drink		1.30	2.43	0	15

Note. *Drink status* refers to a participant indicating if they have drunk alcohol in the last 30 days. *30 avg. drink* refers to the average number of alcoholic drinks consumed in the last 30 days of those who have drank. POC = person of color.

Table 2

Model Fit for Associations Between Adversity and Alcohol Use Change (Unconditional Models)

	Chi square	CFI	RMSEA	Intercept	Intercept Variability	Slope	Slope Variability	Quadratic	Quadratic Variability
Linear Effect	170.665*	0.734	0.207	2.195*	4.966*	-0.113*	-.015		
Quadratic Effect	1.722	0.999	0.031	1.958*	8.137*	1.183*	7.261*	-0.455*	0.484*
Three Waves - Linear	33.35*	0.934	0.205	1.978*	7.063*	0.257*	2.027*		

*Note*. CFI = comparative fit index; RMSEA = root mean square error of approximation; * $p < .05$.

Table 3

Associations Between Adversity and Alcohol Use Change (Conditional Models)

	Chi square	CFI	RMSEA	Intercept		Slope		Quadratic	
				Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Model 1 Fit	10.797*	0.991	0.039						
Model 2 Fit	10.770	0.993	0.032						
Age				0.279*	0.287*	-0.358*	-0.366*	0.083	0.086^ت
Gender (Males)				0.543*	0.585*	0.053	0.123	-0.029	-0.058
Race (POC)				-0.138	-0.199	0.964	0.563	-0.269	-0.238
SES				0.155	0.205*	0.171	0.253	-0.065	-0.099^ت
Adversity					0.172^ت		0.274^ت		-0.113*

Note. POC = person of color; CFI = comparative fit index; RMSEA = root mean square error of approximation; * $p < .05$; ^{ت} = $p < .10$.

Figure 1

Average Alcohol Consumption Across Time
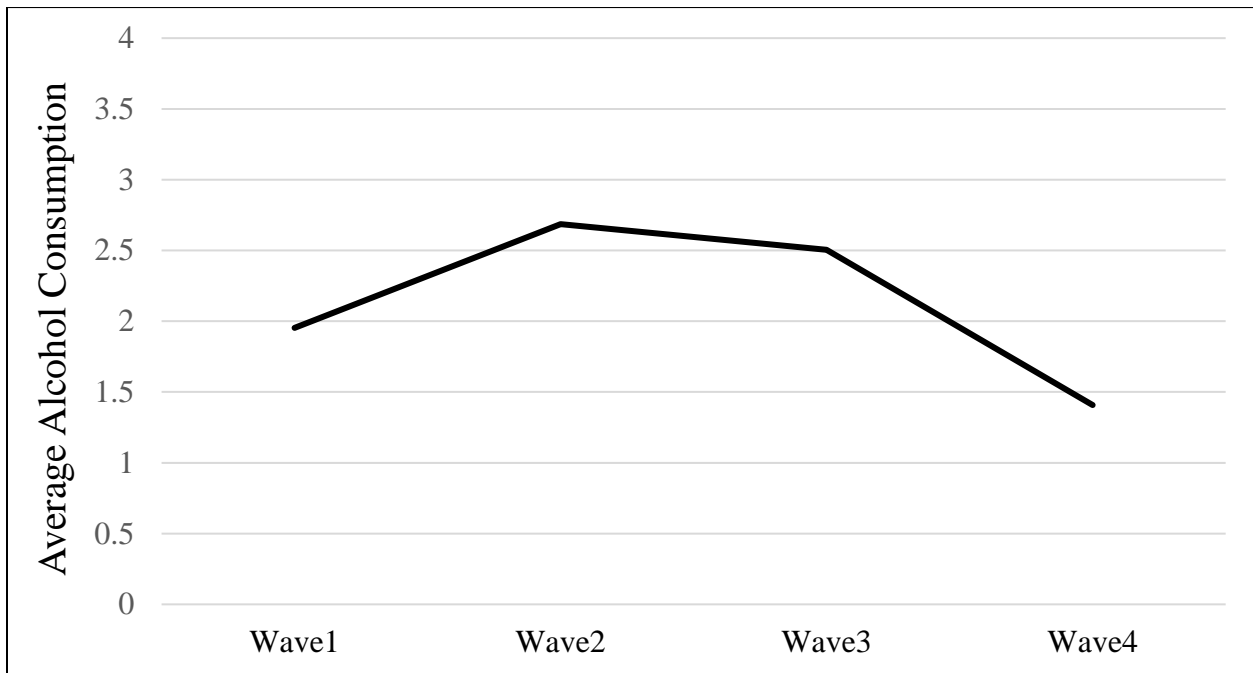
Note. This figure demonstrates the quadratic change in mean alcohol use of all participants across the first year of college. At baseline, the average alcohol consumption was about 2.0 drinks, there was an increase in average drinks by Wave 2, a slight decrease in average drinks to Wave 3, and then a strong decrease in average drinks by Wave 4.

Figure 2

Average Alcohol Consumption and Adversity Across Time
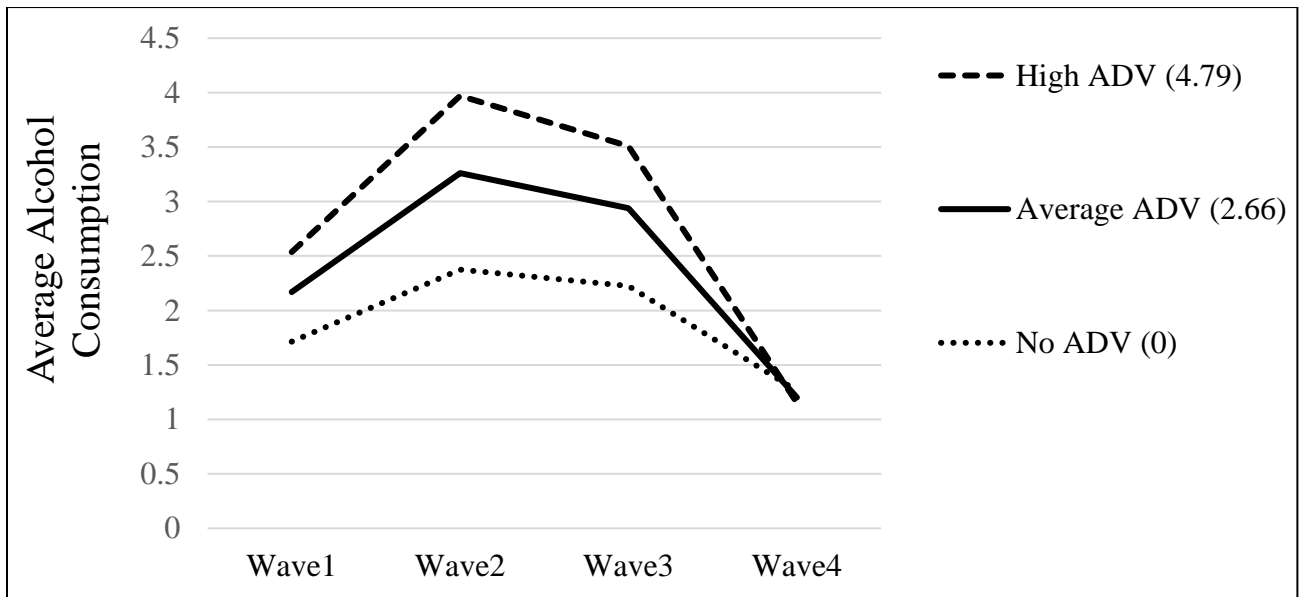
Note. This figure demonstrates how average alcohol use varied related to adversity levels. Alcohol use increased from wave 1-2 and decreased from waves 2-3 for all participants on average. For those with high levels of adversity (1 SD above the mean), the slope shows a steeper decline from wave 3-4 than for those with average levels of adversity or with no adversity.

Appendix A

Adverse Childhood Experiences (ACEs) Questionnaire

While you were growing up, during your first 18 years of life:

Psychological Abuse

1. Did a parent or other adult in the household often or very often…

   Swear at you, insult you, put you down, or humiliate you? or
   Act in a way that made you afraid that you might be physically hurt?
   - Yes = 1, No = 0

Physical Abuse

2. Did a parent or other adult in the household often or very often… Push, grab, slap, or

   throw something at you? or Ever hit you so hard that you had marks or were injured?

   - Yes = 1, No = 0

Sexual Abuse

3. Did an adult or person at least 5 years older than you ever…

   Touch or fondle you or have you touch their body in a sexual way? or
   Attempt or actually have oral or anal intercourse with you?
   - Yes = 1, No = 0

Household Dysfunction (Added emotional and physical neglect)

4. Did you often or very often feel that …

   No one in your family loved you or thought you were important or special? or
   Your family didn't look out for each other, feel close to each other, or support each
   other?
   - Yes = 1, No = 0

5. Did you often or very often feel that …

    You didn't have enough to eat, had to wear dirty clothes, and had no one to protect you?
   or Your parents were too drunk or high to take care of you or take you to the doctor if
   you needed it?
   - Yes = 1, No = 0

6. Was a biological parent ever lost to you through divorced, abandonment, or other reason?

- Yes = 1, No = 0

Mother Treated Violently

7. Was your mother or stepmother:

    Often or very often pushed, grabbed, slapped, or had something thrown at her? or
    Sometimes, often, or very often kicked, bitten, hit with a fist, or hit with something hard?
    or Ever repeatedly hit over at least a few minutes or threatened with a gun or knife?
    - Yes = 1, No = 0

Substance Use

8. Did you live with anyone who was a problem drinker or alcoholic or who used street

    drugs?

    - Yes = 1, No = 0

Mental Illness

9. Was a household member depressed or mentally ill? or

    Did a household member attempt suicide?
    - Yes = 1, No = 0

Criminal Behavior

10. Did a household member go to prison?

    - Yes = 1, No = 0

Note. Questions in red font were added after the original study, making the current ACEs

questionnaire 10 questions.

Appendix B

Informed Consent

The College Student Transition Study
Completing the survey will be quickest (about 45 minutes) if you open it on a computer. There are some compatibility issues if you try to take it on a phone or tablet. If you cannot finish the survey in one sitting, you can pick up where you left off as long as you keep this survey website open on your computer. There is a progress bar at the top of the screen that will let you know how much of the survey you have completed.

Human Research Protocol
Only Minimal Risk Consent with HIPAA
Principal Investigator Nicholas A. Turiano
Department Psychology
Protocol Number 1602014279
Study Title College Student Transition Study

Contact Persons
In the event you experience any side effects or injury related to this research, you should contact Dr. Nicholas A. Turiano at (304) 293-2937. After hours contact: Dr. Turiano at (215) 292-2848. If you have any questions, concerns, or complaints about this research, you can contact Dr. Turiano at (304) 293-2937.

For information regarding your rights as a research subject, to discuss problems, concerns, or suggestions related to the research, to obtain information or offer input about the research, contact the Office of Research Integrity and Compliance at (304) 293-7073. In addition, if you would like to discuss problems, concerns, have suggestions related to research, or would like to offer input about the research, contact the Office of Research Integrity and Compliance at 304-293-7073.

Introduction
You have been asked to participate in this research study, which has been explained to you via an online Qualtrics survey. This study is conducted by Dr. Turiano in the Department of Psychology at West Virginia University.

Purpose(s) of the Study
The purpose of this study is to examine the transition from high school to college at WVU among incoming freshman during the 2019-20 academic year. We will examine how substance use (e.g., alcohol, tobacco, and illicit drugs), sexual behavior, peer networks, academic functioning, and psychological change occurs during the first year of enrollment at WVU. We plan to recruit about 800 freshmen and follow them for 9 months.

Description of Procedures
This study involves questions about your family upbringing, behavior, social networks, academic performance, sexual behavior, and health. It will take approximately 45 minutes to complete the baseline assessment online. Each of the next 3 assessments will occur throughout the next 9

months. It will take under 30 minutes to complete each of these assessments. You do not have to answer any questions you do not want to.

Discomforts
Completing the questionnaires of this study may result in feelings of embarrassment, anxiety, or slight distress. Specifically, we will be asking personal questions about your family life, sexual behavior, your emotional and physical health, and use of alcohol/drugs. Answering these questions is voluntary and you may wish to not answer any of these questions. If you do experience feelings of anxiety while answering these questions, please consult the resources provided in the survey.

Alternatives
You do not have to participate in this study and by not doing so has no consequence on your standing as a WVU student.

Benefits
You may not receive any direct benefit from this study. The knowledge gained from this study may eventually benefit others.

Financial Considerations
You will be paid $20 for the baseline assessment and $10 each for completion of the 3 remaining assessments (up to $50 total). Payments will be made after completion of the study sometime this Spring semester in April 2020. Dr. Turiano will arrange a time/location to pick up payment in 1304 Life Sciences Building or at the Towers on the Evansdale campus.

Confidentiality
Any information about you that is obtained as a result of your participation in this research will be kept as confidential as legally possible. To help us protect your privacy, we have obtained a Certificate of Confidentiality from the National Institutes of Health. The researchers can use this Certificate to legally refuse to disclose information that may identify you in any federal, state, or local civil, criminal, administrative, legislative, or other proceedings, for example, if there is a court subpoena. The researchers will use the Certificate to resist any demands for information that would identify you.

The Certificate cannot be used to resist a demand for information from personnel of the United States federal or state government agency sponsoring the project or the study sponsor (West Virginia Clinical and Translational Science Institute). You should understand that a Certificate of Confidentiality does not prevent you or a member of your family from voluntarily releasing information about yourself or your involvement in this research. If an insurer, medical care provider, or other person obtains your written consent to receive research information, then the researchers will not use the Certificate to withhold that information.

In addition, there are certain instances where the researcher is legally required to give information to the appropriate authorities. These would include mandatory reporting of information about behavior that is imminently dangerous to you or to others, such as suicide, abuse, etc.

In any publications that result from this research, neither your name nor any information from which you might be identified will be published without your consent.

HIPAA
We know that information about you and your health is private. We are dedicated to protecting the privacy of that information. Because of this promise, we must get your written authorization (permission) before we may use or disclose your protected health information or share it with others for research purposes. You can decide to agree or not agree before beginning this survey. If you choose not to agree to this survey, you will not be able to take part in the research study. Whatever choice you make about this research study will not have an effect on your standing here at WVU or access to University resources.

Persons/Organizations Providing the Information
You will provide information on your own health.

Persons/Organizations Receiving the Information
The research site(s) carrying out this study. This includes all study personnel, and the people and companies that they use to oversee, manage, or conduct the research, the members and staff of any Institutional Review Board (IRB) that oversees this research study, and the West Virginia University Office of Research Integrity and Compliance and Office of Sponsored Programs.

The Following Information Will Be Used
Demographic data and information that you report on social, academic, behavioral, psychological, and your health will be used for research purposes. We will also use information provided by the West Virginia University offices of Enrollment Management and Registrar offices such as your basic demographic information, credit hours, grades, grade point average, etc.

The Information is Being Disclosed for the Following Reasons
Publication of study results (without identifying you) and in preliminary data for grant purposes.

You May Cancel this Authorization at Any Time by Writing to the Principal Investigator
Nicholas A. Turiano, PhD
53 Campus Drive, Room 2212 Life Sciences Building
Morgantown WV 26506

If you cancel this authorization, any information that was collected already for this study cannot be withdrawn. Once information is disclosed, according to this authorization, the recipient may redisclose it and then the information may no longer be protected by federal regulations. You have a right to see and make copies of your research records. You will not be able to see or copy your records related to the study until the sponsor has completed all work related to the study. At that time you may ask to see the study principal investigators files related to your participation in the study and have the study principal investigator correct any information about you that is

wrong. This authorization will expire at the end of the study unless you cancel it before that time.

Voluntary Participation

Participation in this study is voluntary. You are free to withdraw your consent to participate in this study at any time. Refusal to participate or withdrawal will not affect your class standing at West Virginia University and will involve no penalty to you. Refusal to participate or withdrawal will not affect your future care, or your employment status at West Virginia University. In the event new information becomes available that may affect your willingness to participate in this study, this information will be given to you so that you can make an informed decision about whether or not to continue your participation. If you have any questions, please contact the principal investigator (Dr. Nicholas Turiano) prior to agreeing to be a part of this study (215-292-2848; naturiano@mail.wvu.edu).

Appendix C

Demographics

1. As of today, are you 18 years of age or older?

- ○ Yes

- ○ No

2. What is your ethnicity?

- ○ Hispanic or Latino

- ○ Not Hispanic or Latino

3. What is your race?

- ○ American Indian/Alaskan Native

- ○ Black or African American

- ○ White/Caucasian

- ○ Mixed

- ○ Unknown

- ○ Other (please specify) _____

4. What is your gender?

- ○ Male

- ○ Female

- ○ Other (please specify) _____

5. Imagine that this ladder shows how your society is set up. At the top of the ladder are the people who are the best off - they have the most money, the highest amount of schooling, and the jobs that bring the most respect. At the bottom are people who are the worst off - they have the least money, little or no education, no jobs or jobs that no one wants or respects.

Now think about your family. Please tell us where you think your family would be on this ladder. Select the number of the rung that best represents where your family would be on this ladder.
- ○ 1 = worst off, 2, 3, 4, 5, 6, 7, 8, 9, 10 = best off

Best off

Worst off
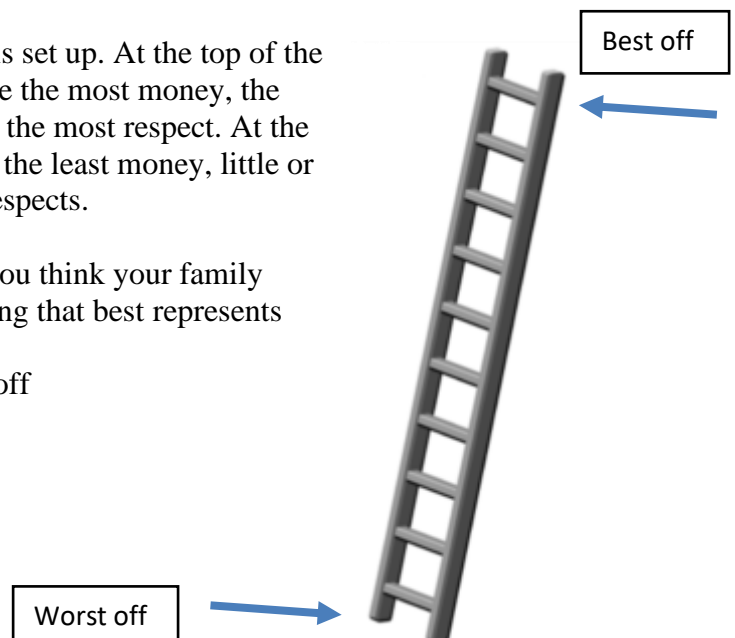
Appendix D

Adversity Questions

The next set of questions focus on **physical, emotional, sexual, or dangerous experiences** some children have. Please think of how true each statement is for you. Some of these questions may not apply to you. You can also choose not to answer any question if you feel uncomfortable doing so.

Category 1: Physical Situations

1a. Did a parent or other adult in the household ever swear at you, insult you, put you down, or humiliate you?
   - Never true = 0, Rarely true = 1, Sometimes true = 2, Often true = 3, Very often true = 4

1b. Did a parent or other adult in the household ever act in a way that made you feel afraid that you might be physically hurt?
   - Never true = 0, Rarely true = 1, Sometimes true = 2, Often true = 3, Very often true = 4

2a. Did a parent or other adult in the household ever push, grab, slap, or throw something at you?
   - Never true = 0, Rarely true = 1, Sometimes true = 2, Often true = 3, Very often true = 4

2b. Did a parent or other adult in the household ever hit you so hard that you had marks or were injured?
   - Never true = 0, Rarely true = 1, Sometimes true = 2, Often true = 3, Very often true = 4

Category 2: Emotional Situations

3a. Did you ever feel that no one in your family loved you or thought you were important or special?
   - Never true = 0, Rarely true = 1, Sometimes true = 2, Often true = 3, Very often true = 4

3b. Did you ever feel that your family didn't look out for each other, feel close to each other, or support each other?
   - Never true = 0, Rarely true = 1, Sometimes true = 2, Often true = 3, Very often true = 4

Category 3: Sexual Situations

4a. Did an adult or person at least 5 years older than you ever touch or fondle you or have you touch their body in a sexual way?
   - Never true = 0, Rarely true = 1, Sometimes true = 2, Often true = 3, Very often true = 4

4b. Did an adult or person at least 5 years older than you ever attempt or actually have oral, anal, or vaginal intercourse with you?
- Never true = 0, Rarely true = 1, Sometimes true = 2, Often true = 3, Very often true = 4

Category 4: Dangerous Situations

5a. Was your mother (or mother-like figure) ever pushed, grabbed, slapped, or had something thrown at her?
- Never true = 0, Rarely true = 1, Sometimes true = 2, Often true = 3, Very often true = 4

5b. Was your mother (or mother-like figure) ever kicked, bitten, hit with a fist, or hit with something hard?
- Never true = 0, Rarely true = 1, Sometimes true = 2, Often true = 3, Very often true = 4

5c. Was your mother (or mother-like figure) ever repeatedly hit over at least a few minutes or threatened with a gun or knife?
- Never true = 0, Rarely true = 1, Sometimes true = 2, Often true = 3, Very often true = 4

6. Did you live with anyone who was a problem drinker or alcoholic, or who used street drugs?
- Never true = 0, Rarely true = 1, Sometimes true = 2, Often true = 3, Very often true = 4

7. Was a household member depressed or mentally ill, or did a household member attempt suicide?
- Never true = 0, Rarely true = 1, Sometimes true = 2, Often true = 3, Very often true = 4

8. Did a household member go to prison?
- Never true = 0, Rarely true = 1, Sometimes true = 2, Often true = 3, Very often true = 4

Category 5: Household dysfunction

9.What is the marital status of your parents?
- Single = 1, Married = 2, Separated = 3, Divorced = 4, Biological mother deceased = 5, Biological father deceased = 6

10a. Did you feel that you didn't have enough to eat, had to wear dirty clothes, and had no one to protect you?
- Never true = 0, Rarely true = 1, Sometimes true = 2, Often true = 3, Very often true = 4

10b. Did you feel that your parents were too drunk or high to take care of you or take you to the doctor if you needed it?
- Never true = 0, Rarely true = 1, Sometimes true = 2, Often true = 3, Very often true = 4

Appendix E

Alcohol Use Questions

The next set of questions are about your alcohol use. This includes coolers; beer; wine; champagne; liquor such as whiskey, rum, gin, vodka, bourbon, tequila, scotch, brandy, cognac, or liqueurs; and also, any other type of alcohol.

1. Have you ever had more than a few sips of beer, wine, or any drink containing alcohol? If you only had a sip or two from a drink (e.g., from a parent) select "NO".

- ○ Yes

- ○ No

6. Have you drank any alcohol in the past 30 days?

- ○ Yes

- ○ No

For the following questions, a single drink refers to a 12 ounce can or bottle of beer, or wine cooler, a 5-ounce glass of wine, champagne, or sherry, a shot of liquor or a mixed drink or cocktail.

104. In the past 30 days, **how many alcoholic drinks** did you have on a typical day when you drank alcohol? _____

Appendix F. Sensitivity Analyses for Each ACE Indicator

	Physical Abuse 42.19%	Psychological Abuse 69.82%	Familial Love 43.32%	Sexual Abuse 4.55%	Domestic Violence 17.32%	Familial Substance Use 18.60%	Familial Mental Health 24.22%	Familial Incarceration 6.35%	Single-Parent 31.78%	Basic Needs 9.07%
Chi Square	9.871	10.861	9.863	15.883*	10.058	13.006	13.568	11.582	10.923	10.830
CFI	0.994	0.993	0.994	0.985	0.994	0.989	0.988	0.991	0.992	0.992
RMSEA	0.029	0.033	0.029	0.047	0.030	0.039	0.041	0.035	0.033	0.033
Adversity - Int	0.420*	0.685*	-0.097	0.616	0.083	0.384	0.041	-0.316	-0.058	0.094
Adversity - Slope	0.280	0.291	0.388	1.383*	0.321	0.314	0.758*	0.890	-0.231	0.123
Adversity - Quad	-0.143	-0.161	-0.125	-0.493*	-0.167	-0.134	-0.269*	-0.261	0.084	-0.049

Note. * $p < .05$. All indicators were tested in a separate model controlling for age, gender, race, and SES. Item 1 = "if an adult ever pushed/grabbed/slapped/threw something at them OR ever hit so hard it left marks"; Item 2 = "if an adult ever swore at/insulted/humiliated them OR made them feel afraid they might be physically hurt"; Item 3 = "ever felt that no one in the family loved them/thought they were special OR that family didn't look out for each other"; Item 4 = "adult ever touched/fondled them OR ever attempted to/actually had oral, anal, or vaginal intercourse with them"; Item 5 = "mother was ever pushed/grabbed/slapped/had something thrown at her OR ever kicked/bitten/hit/threatened with weapon"; Item 6 = "ever live with a problem drinker/alcoholic OR someone who used street drugs"; Item 7 = "a household member was depressed/mentally ill OR attempted suicide"; Item 8 = "household member ever went to prison"; Item 9 = "parents single/separated/divorced OR deceased"; Item 10 = "didn't have enough to eat growing up/had to wear dirty clothes/had no one to protect them OR parents were too drunk or high to take care of them/to the doctor".

Appendix G. Sensitivity Analyses for Each ACE Indicator in a Single Model

	Physical Abuse	Psychological Abuse	Familial Love	Sexual Abuse	Domestic Violence	Familial Substance Use	Familial Mental Health	Familial Incarceration	Single-Parent	Basic Needs
Adversity - Intercept	0.283	0.789	-0.438[t]	0.636	-0.171	0.459	-0.141	-0.427	-0.027	-0.130
Adversity - Slope	0.129	-0.056	0.242	0.567	0.054	0.083	0.615[t]	0.892	-0.331	-0.257
Adversity - Quad	-0.059	-0.047	-0.049	-0.230	-0.074	-0.054	-0.201	-0.232	0.131	0.118

Note. All indicators were tested in a in a single model controlling for age, gender, race, and SES. [t] = $p < .10$. Chi Square = 21.104; CFI = 0.991; RMSEA = 0.023; Item 1 = "if an adult ever pushed/grabbed/slapped/threw something at them OR ever hit so hard it left marks"; Item 2 = "if an adult ever swore at/insulted/humiliated them OR made them feel afraid they might be physically hurt"; Item 3 = "ever felt that no one in the family loved them/thought they were special OR that family didn't look out for each other"; Item 4 = "adult ever touched/fondled them OR ever attempted to/actually had oral, anal, or vaginal intercourse with them"; Item 5 = "mother was ever pushed/grabbed/slapped/had something thrown at her OR ever kicked/bitten/hit/threatened with weapon"; Item 6 = "ever live with a problem drinker/alcoholic OR someone who used street drugs"; Item 7 = "a household member was depressed/mentally ill OR attempted suicide"; Item 8 = "household member ever went to prison"; Item 9 = "parents single/separated/divorced OR deceased"; Item 10 = "didn't have enough to eat growing up/had to wear dirty clothes/had no one to protect them OR parents were too drunk or high to take care of them/to the doctor".