EXAMINING THE EFFECTS OF MATERNAL BINGE-DRINKING AND MARIJUANA USE ON CHILDREN'S MENTAL HEALTH TRAJECTORIES: A LATENT CLASS GROWTH ANALYSIS

by

Ginnie Sawyer Morris

A thesis submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Master of Science in Human Development and Family Sciences

Spring 2019

EXAMINING THE EFFECTS OF MATERNAL BINGE-DRINKING AND MARIJUANA USE ON CHILDREN'S MENTAL HEALTH TRAJECTORIES: A LATENT CLASS GROWTH ANALYSIS

by

Ginnie Sawyer Morris

Approved: _____
Jennifer L. Carrano, Ph.D.
Professor in charge of thesis on behalf of the Advisory Committee

Approved: _____
Bahira Sherif Trask, Ph.D.
Chair of the Department of Human Development and Family Sciences

Approved: _____
Carol Vukelich, Ph.D.
Dean of the College of Education and Human Development

Approved: _____
Douglas J. Doren, Ph.D.
Interim Vice Provost for Graduate and Professional Education

ACKNOWLEDGMENTS

I would like to first thank my committee for their support throughout this process. To Drs. Jennifer Carrano, Valerie Earnshaw, and Allison Karpyn, I am very grateful for your advocacy and mentorship. I have learned so much from working with each of you individually and collaboratively. As my teachers and mentors, you have taught me a great deal about scientific research but you have also shown me by example what a strong, supportive female mentor looks like. You have each had a profound impact on my development both professionally and personally – thank you.

To Dr. Joe Glutting, thank you for your honest and transparent approach to teaching and mentorship. Your teaching provided me with an opportunity to learn statistics in an applied way and your advice about the academy still resonates with me. Thank you for investing your time and energy into this project as well as my professional development.

To Drs. Bahira Trask and Barbara Settles, thank you for teaching me what it means to be an HDFS scholar. Thank you for instilling within your students the importance of family in research. And, most importantly, thank you for the committed and patient guidance you offered me during the first two years of my program. You helped me find my way and I am grateful for the opportunities you created to learn from you and other faculty in our department.

To my fellow graduate students, thank you for your constant support; I am so grateful for our community. To my family, thank you for your love and compassion.

And to my husband, Adam, thank you for your patience, kindness, and love – I would not be able to do this without you.

Finally, to Dr. Linda Muthén, thank you for your help. I hope to someday thank you in person but until then please know I am extremely grateful for the advice you provide to Mplus beginners like me.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Maternal substance abuse has been shown to adversely affect children's behavioral development; however, to date, most research has focused on more extreme types of problematic substance use. Using latent class growth modeling to analyze secondary longitudinal data from the Fragile Families and Child Wellbeing Study (N = 4,898), the present study sought to 1) characterize the development of individuals' externalizing and internalizing behavior trajectories across three distinct developmental periods – early childhood, middle childhood, and adolescence; and, 2) explore whether moderate types of maternal substance use (i.e. binge drinking and marijuana use) predict class membership across the trajectories. Findings from Aim 1 revealed heterogeneity in children's externalizing and internalizing pathways. Aim 2 showed that maternal binge-drinking and marijuana use increased the likelihood of children/adolescents demonstrating borderline and/or clinical externalizing and internalizing trajectories. Specifically, children whose mothers engaged in binge-drinking and/or marijuana use were more likely to experience negative externalizing and internalizing symptom trajectories compared to their peers though the ages at which these behaviors manifest differed across groups.

Together, these findings show that maternal binge-drinking and marijuana use may adversely affect children's behavioral development though binge-drinking seems to have more detrimental effects. In certain groups, maternal binge-drinking may affect children's externalizing and internalizing behavior as early as age five, making it extremely important to equip healthcare professionals (i.e. primary care physicians and pediatricians) with the knowledge and skills to diagnose and treat maternal SUDs (i.e. via screenings).

Chapter 1

INTRODUCTION

Children of substance using parents often suffer a far more volatile, abusive and neglectful childhood than children in other households (Child Welfare Information Gateway, 2014). They are more susceptible to mental health disorders and trauma and more likely to experience difficulties with concentration and learning, controlling physical and emotional responses to stress, and forming trusting relationships (Lipari & Van Horn, 2017; Staton-Tindall, Sprang, Clark, Walker, & Craig, 2013). Maternal substance abuse is particularly problematic as mothers historically have held the role of primary caregiver (Hesselbrock, Meyer, & Keener, 1985). While prior literature has demonstrated that heavy parental substance use has negative effects on children's development, it remains unclear whether more moderate types of substance use such as maternal binge-drinking and marijuana use affect children's mental health in the same way as other forms of substance use. The current study used longitudinal data from the Fragile Families and Child Wellbeing Study to explore how maternal substance use (binge-drinking and marijuana use) affects child mental health outcomes from early childhood to adolescence using latent class growth analysis.

Chapter 2

LITERATURE REVIEW

Children's Externalizing and Internalizing Behavior

Studies using the Child Behavior Checklist (CBCL) (Achenbach, 1991), a common measure of both behavioral (externalizing) and emotional (internalizing) symptoms, have generally linked maternal substance abuse to children's negative behavioral and emotional functioning. According to data collected by the Centers for Disease Control and Prevention (CDC) between 2005 and 2011, 3.5% of children have a current diagnosis of behavioral or conduct problems (externalizing), and 5.1% of children have a current diagnosis of either anxiety or depression (U. S. Department of Health and Human Services and CDC, 2013). Children's externalizing symptoms are problem behaviors that are directed outward, or toward the external environment (physical or social) (Gresham & Kern, 2004). Children's externalizing behaviors can include aggression, rule-breaking, and substance use or abuse (Achenbach, 1991). Internalizing behavior can be defined as a broad class of behaviors in which children direct feelings and emotions inward (Gresham & Kern, 2004). Some examples of internalizing behaviors are somatic complaints, depression, and anxiety (Achenbach, 1991). Externalizing and internalizing symptoms can first emerge in toddlerhood and may continue to develop a trajectory toward maladaptive behavior and psychopathology across the lifespan (Wiggins, Mitchell, Hyde, & Monk, 2015). Higher internalizing and externalizing symptoms in early childhood are predictive of negative outcomes across middle childhood, adolescence, and adulthood (Brennan, Shaw, Dishion, & Wilson, 2012; Roza, Hofstra, van der Ende, & Verhulst, 2003), although different predictive paths have been observed. Children who exhibit

aggression, an externalizing symptom, in early childhood are more likely to engage in adult crime and violence (Liu, 2004). High levels of internalizing behavior in young children have been associated with increased levels of anxiety and depression in adolescence that persists into adulthood (Mesman & Koot, 2001). Therefore, understanding the development of externalizing and internalizing trajectories from early childhood to adolescence provides an informative backdrop for understanding how to design prevention or intervention efforts (Dishion et al., 2008).

Parental Substance Use

While symptoms of psychopathology affect the population at large, rates of children's externalizing and internalizing problem behaviors are all the more prevalent in families with substance use disorders (Peleg-Oren & Teichman, 2006). This is particularly problematic as 7.5 million children live in households with at least one parent who suffers from an alcohol use disorder and 2.1 million children live with at least one parent who suffers from an illicit drug use disorder (Lipari & Van Horn, 2017).

Parental substance use has been identified as one important predictor of children's development of severe externalizing and internalizing trajectories. Children of families with heavy substance use or misuse have been shown to be at increased risk of a range of adverse outcomes including problem behaviors such as externalizing and internalizing behaviors (Gabel & Shindledecker, 1992), social isolation (Dore, Nelson-Zlupko, & Kaufmann, 1999) and neglect (Pivnick & Villegas, 2000) often because parents who abuse substances are less likely to provide the supervision, support and social engagement that their children need to thrive developmentally (Johnson & Leff, 1999). Whitaker, Orzol, & Kahn (2006) found that with an increase

in parental substance use comes an increase in children's behavioral and emotional symptoms.

Few studies have compared the effects of parental alcohol abuse versus parental drug abuse on children's outcomes; of the research that is available two studies found that children of parents who abused drugs exhibited more psychological problems such as fear, anxiety, low self-esteem, emotional deprivation, and aggressiveness than children of parents who abused alcohol (Kelley & Fals-Stewart, 2004; Wilens et al., 2002).

Effects of parental substance use seem to be further differentiated depending on whether it is the mother or the father who has the SUD. For instance, in the literature on children of alcoholics, children of alcoholic fathers have been found to exhibit higher rates of externalizing behavior problems as well as a lack of behavioral inhibition (Blackson, 1994; DeLucia, Belz, & Chassin, 2001; Eiden, Edwards, & Leonard, 2007); whereas, children of alcoholic mothers with mental disorders been found to exhibit higher rates of internalizing behavior problems, but not externalizing behavior problems (Hser et al., 2015). These results are consistent with what we know about the gender differences that exist among individuals with SUD; men, more often than not report using substances for recreational purposes whereas women generally use substances to cope with internalizing symptoms such as depression or anxiety (Center for Substance Abuse Treatment, 2009). Additionally, children of mothers with SUD are at an increased risk, relative to children of fathers with SUD, due to the negative outcomes associated with prenatal drug and alcohol use, such as neonatal abstinence disorder and fetal alcohol syndrome disorder (NIDA, 2015; Sokol,

Delaney-Black, & Nordstrom, 2003; U.S. Department of Health and Human Services (HHS), Office of the Surgeon General, 2016).

Parental Problem Drinking and Marijuana Use

Problem Drinking

It is estimated that 195.8 million adults (26+) engage in binge-drinking, while 58.3 million adults (26+) engage in marijuana use (National Center for Health Statistics, 2017). While binge-drinking among parents is not necessarily indicative of alcohol abuse or alcoholism, parents who binge-drink are at a higher risk for developing alcohol-related disorders compared to parents who do not binge-drink (Child Trends Databank, 2015). In addition, parents who drink alcohol to excess may be more likely to abuse their children due to lowered inhibitions, sharpened aggressive feelings, decreased frontal lobe functioning, and disrupted neurochemical functions that mediate aggressive behavior, all outcomes of alcohol abuse (National Center on Addiction and Substance Abuse, 1999). And, children whose parents have alcohol problems are at greater risk for depression, anxiety disorders, and problems with cognitive and verbal skills (Lipari & Van Horn, 2017).

Though it is often an integral part of the normative alcohol use and misuse trajectory, binge drinking has been identified as a significant public health issue for adolescents in the United States (Tucker, Orlando, & Ellickson, 2003). This behavior typically starts during adolescence, reaches a high point during young adulthood (18-25), and gradually returns to moderate levels during adult years (Muthén & Muthén, 2000; Tucker et al., 2003). However, not everyone follows the normative trajectory. Some individuals continue to use alcohol heavily into adulthood, but much less is

known about patterns of parental binge-drinking (Rossow, Felix, Keating, & McCambridge, 2016).

In their study exploring adverse childhood experiences (ACEs) of children of alcoholics (n = 1,894), Anda and colleagues (2002) found children's internalizing (e.g., depression, anxiety) and externalizing (e.g., drug abuse, suicide) symptoms were more severe when the mother was an alcoholic; the risk did not significantly increase when both parents were alcoholics. In another study examining early behavioral outcomes of young children of alcoholics (n = 212), Puttler, Zucker, Fitzgerald, & Bingham (1998) found that children of alcoholics had poorer functioning than controls in the externalizing behavior domain; children from antisocial alcoholic families had greater problems than children from non-antisocial alcoholic families; and older children had more internalizing problems than younger children, a finding that is consistent with other studies on children's internalizing trajectories (Puttler et al., 1998). Finally, Finan, Schulz, Gordon, & Ohannessian (2015) found that maternal problem drinking was negatively associated with adolescent-mother communication and family cohesion, but was positively correlated with adolescent drug use and rule breaking (externalizing behaviors).

Studies have found mixed results when it comes to how parental problem drinking predicts internalizing and externalizing behavior, but it is clear that parental problem drinking negatively affects children's mental health outcomes. Another salient finding across these studies is the role of family cohesion and family environments, which further demonstrates the importance of contextual factors (e.g., marital status, socioeconomic status, gender, race/ethnicity) in examining the effects of parental substance use on children's mental health trajectories. There is little

evidence available on how parental binge-drinking specifically affects children's mental health, as most studies have utilized other measures of problematic drinking (e.g., heavy drinking). The current study addresses this gap by exploring the role maternal binge-drinking plays in predicting children's externalizing and internalizing behaviors.

Marijuana Use

Despite recent movements towards the legalization of marijuana, it remains the most commonly used illicit drug worldwide. According to the CDC, 58.6 million (18% of total population) people ages 26+ reported using marijuana in 2015 in the U.S. (National Center for Health Statistics, 2017). Though it is the most widely used illicit substance, there is a paucity of evidence related to parental use of marijuana and its effects on child outcomes. Similar to binge-drinking, research on marijuana use focuses mainly on adolescents and their corresponding use trajectories, which typically begin during early adolescence and increase significantly during young adulthood (Degenhardt & Hall, 2012; Tucker, Ellickson, Orlando, Martino, & Klein, 2005).

Of the literature that does exist on parental marijuana use and its subsequent effects on children's development, the scope is limited and focuses primarily on maternal use during pregnancy. In their systematic review of studies comparing rates of pre-specified adverse neonatal outcomes in women who used marijuana during pregnancy with women who did not, Conner et al. (2016) found that after adjusting for confounding factors, marijuana use during pregnancy did not serve as an independent risk factor for adverse neonatal outcomes. Contrastingly, in their longitudinal study (N = 763) evaluating the effects of prenatal marijuana exposure (PME), Day,

Goldschmidt, & Thomas (2006) found that prenatal exposure to marijuana served as a significant predictor of child marijuana use at age 14.

Within the literature examining parental marijuana use beyond the pre-natal stage, findings tend to vary. Some studies found that parental use influenced children's externalizing behavior, whereas others found the presence of family problems to be more influential as a predictor. For instance, Li, Pentz, & Chou (2002) found that parents' marijuana use influenced adolescent externalizing behavior (i.e. substance use). Specifically, marijuana use by one parent was associated with more than twice the risk of adolescent use of cigarettes, alcohol or marijuana compared to no parent use of marijuana. And, if two parents used marijuana (in comparison to one parent using) then both adolescent cigarette use and marijuana use were significantly increased (Li et al., 2002).

In summary, research has determined that parental substance use negatively affects children's mental health and this is all the more true for mothers (versus fathers) with substance use problems as they are often the primary caregiver. However, it is still unclear as to whether maternal binge drinking and marijuana use specifically play a role as independent risk factors in children's development of internalizing and externalizing trajectories. It is this gap, among others, that this study sought to address.

Theoretical Framework

Lifespan Development & Relational Developmental Systems Metatheory (RDS)

Baltes, Reese, & Lipsitt (1980) assert that a developmental orientation is needed whenever the behavior identified involves a change process and is better

understood if placed in the context of interdependent interactions over time. The contemporary lifespan development perspective consists of a relational meta-model that emphasizes the study and integration of different levels of organization as a means to understand human development across the lifespan (Lerner, 2006; Overton, 2013). This meta-model is called the Relational Developmental Systems Metatheory (RDS).

RDS is a metatheoretical framework that provides a holistic and integrative perspective on human developmental processes across contexts and over time (Bates & Labouvie, 1997; Pandina, Labouvie, & White, 1984). The fundamental assumption underlying RDS is that developmental change can occur throughout the lifespan (Lerner, Leonard, Fay, & Issac, 2011), wherein individuals change in both quantitative and qualitative ways (Lerner, 1984). Although some processes and variables remain the same across an individual's life, developmental trajectories are not fixed, as plasticity allows change to occur throughout every stage of life (Lerner, 1984; Lerner, 2002).

The current study uses RDS as a theoretical framework through which parental and child behavior are viewed as a series of multiple developmental trajectories that occur across time and in relationship with the social and environmental contexts in which they exist (Parke, Ornstein, Rieser, & Zahn-Waxler, 1994). A developmental trajectory is the path an individual's behavior takes over time in a particular domain. By definition, this perspective is person-centered and longitudinal rather than variable-centered and cross-sectional (Holden, 2010). In order to understand the trajectory of an individual, you must also take into account their context. Person-centered analytic approaches provide insight not only into the individual's trajectory, but also the contextual factors that serve to predict change over time. Growth modeling approaches

are among the most appropriate methods of measurement for these purposes. However, conventional growth modeling methods (e.g., latent growth curve) make the assumption that a single trajectory can accurately represent all individuals within a given population (Duncan, Duncan, Stryker, Li, & Alpert, 1999; Jung & Wickrama, 2008). This assumption is directly counter to the RDS framework set forth by lifespan developmental researchers. Over the past two decades, analytic approaches for longitudinal developmental trajectories have evolved, better enabling developmental researchers to capture information about inter-individual differences within intra-individual change across time.

The lifespan development perspective asserts that children's development occurs as a result of multiple and continuous transactions between their own characteristics and their social, physical, and temporal environments. Therefore, not all children's developmental pathways are going to look the same. Person-centered analytic approaches (PSA), such as latent class growth analysis, provide researchers with tools to predict negative symptoms of mental health from an early age (Wiggins et al., 2015). These approaches have been used widely to identify the developmental trajectories associated with children's internalizing (e.g., depression and anxiety) and externalizing behaviors (e.g., aggression, rule-breaking), two symptoms of psychopathology that have been associated with parental substance abuse.

The Current Study

While the effects of parental substance use on children's mental health (e.g., externalizing and internalizing behaviors) have been explored in the literature, a few gaps still exist. For example, parental substance abuse is often broadly defined to capture multiple types of substance use and misuse, limiting our ability to delineate

the effects of specific types of substance use on children's wellbeing. Research needs to parse out what types of substances parents are using in order to investigate whether and how specific types of substance use play a predictive role in children's outcomes over time (e.g., do children whose parents use marijuana develop differently than children whose parents binge-drink?).

Secondly, of the evidence that is available on the effects of parental binge-drinking and marijuana use, several limitations exist. For example, over the years the National Institute on Alcohol Abuse and Alcoholism (NIAAA) and the CDC have differentiated binge drinking from heavy alcohol use (NIAAA, 2017; Substance Abuse and Mental Health Services Administration [SAMHSA], 2016) by establishing clear definitions for each. However, these two terms are often used interchangeably in the literature, making it difficult to draw conclusions regarding how specific types of problem drinking influence children's wellbeing. Another term that complicates the literature is "problem drinking." Problem drinking is a general term used to describe any type of alcohol use that negatively affects an individual's health. This term is used to differentiate substance use behaviors such as binge-drinking and heavy alcohol use from alcoholism. Therefore, both binge-drinking and heavy alcohol use qualify as types of problem drinking. Instead of grouping various types of problem drinking together, studies should differentiate between them as there may be differential effects depending on the specific type of problem drinking.

An even larger gap exists in relation to parental use of marijuana and its effects on children's developmental outcomes. Outside of marijuana use during pregnancy, parental marijuana use is rarely explored as an independent risk factor of children's mental health outcomes, and within the limited research that is available findings tend

to vary (Hser et al., 2015; Li et al., 2002). By comparing the effects of maternal marijuana use with maternal binge-drinking on children's mental health outcomes, the current study is not only filling this gap, but also providing evidence to inform policy, which is important given the recent push for legalization of recreational marijuana in the United States.

Previous studies have employed variable-centered approaches to explore the effects of parental substance use on children's mental health (e.g., Hser et al., 2015; Puttler et al., 1998). Variable-centered approaches focus on the structure of variables across persons, rather than the patterns of behavior within persons (Marsh, Lüdtke, Trautwein, & Morin, 2009). An additional assumption underlying variable-centered methods is that the variable/outcome relationship is the same across all members of the population; however, this often not the case (Laursen & Hoff, 2006). By using data that is longitudinal and a method that is developmentally-appropriate (person-centered approach), the current study addresses an important gap in parental substance use literature and contributes evidence to help us better understand the effects of specific types of maternal substance use on children's mental health.

Research Questions and Hypotheses

The current study used longitudinal data from the Fragile Families and Child Wellbeing Study to explore how maternal substance use predicts child mental health outcomes from early childhood to adolescence using a person-centered analytic approach. The overarching goal of the current project is to determine whether maternal binge-drinking and marijuana use influence children's internalizing and externalizing trajectories and whether effects differ between the two substances using latent class

growth analysis. Two aims were addressed in this research: 1) to classify individuals based on development of externalizing and internalizing symptoms from early childhood to adolescence, and 2) to examine whether specific types of maternal substance use (i.e. binge drinking, marijuana use) predict class membership across children's externalizing and internalizing trajectories.

Aim 1: Classify Individuals' Development of Externalizing and Internalizing Symptoms From Early Childhood to Adolescence.

The purpose of this aim was to classify children's externalizing and internalizing trajectories across three developmental periods: early childhood, middle childhood, and adolescence. Based on previous studies of children's externalizing and internalizing trajectories, it was hypothesized that children's externalizing trajectories would differ significantly across three groups, and children's internalizing trajectories would differ significantly across two to four groups. It was expected that, for both the externalizing and internalizing models, at least one of the trajectories would start high in early childhood and remain stable throughout adolescence and at least one trajectory would start low and remain stable throughout adolescence.

Aim 2: Examine Whether Maternal Binge Drinking and Marijuana Use Predict Children's Externalizing and Internalizing Trajectories.

To date, most research has focused on more extreme types of substance abuse (e.g., heaving drinking, SUD); therefore, the purpose of this aim was to examine how specific types of maternal substance use (i.e. binge drinking and marijuana use) predict class membership across children's externalizing and internalizing trajectories. Based on previous studies showing that alcohol use is linked to increased negative mental health outcomes (Anda et al., 2002; Finan et al., 2015; Puttler et al., 1998), it

was hypothesized that children whose mothers reported binge-drinking would be more likely to demonstrate severe trajectories of externalizing and internalizing behaviors relative to children whose mothers did not report binge-drinking. Due to the limited extant literature on the effects of parental marijuana use, it was less clear what effects maternal marijuana use would have on children's externalizing and internalizing trajectories. Nonetheless, it was hypothesized that children of parents who use marijuana would exhibit more severe patterns of externalizing and internalizing trajectories than children whose mothers did not report using marijuana.

Chapter 3

METHODS

Data and Sample

Data were drawn from the Fragile Families and Child Wellbeing Study (FFCWS), a longitudinal multimethod study of children and families conducted by Princeton University and Columbia University. The FFCWS includes data on 4,898 families (roughly three-quarters of whom were unmarried) in large cities across the United States (Reichman, Teitler, Garfinkel, & McLanahan, 2001). The FFCWS used a stratified random sampling design of U.S. cities with populations of > 200,000; stratification was based on the public policy environments and local labor market conditions in the cities, and sampling occurred at three stages: cities, hospitals within cities, and births within hospitals (see Reichman et al., 2001).

The current study's sample was limited to biological mothers and their children from the following waves of the FFCWS: child age five, child age nine, and child age 15. The child age five wave data were collected between 2003 and 2006 and the completion rate for the mother sample was 85%. The child age nine wave data were collected between 2007 and 2010 and the completion rate for the mother sample was 76%. The child age 15 wave data were collected between 2014 and 2017 and the completion rate was 73%. In these waves, mothers were asked about demographics (age, race/ethnicity, immigration status, education), relationships and social support, child behavioral outcomes, welfare and family financial status, and incarceration. Additionally, mothers were asked about their own substance use (binge drinking and marijuana use) across two time points, child age 5 and child age 9. Children's behavioral outcomes (externalizing and internalizing) as reported by biological

mothers were assessed at the following waves: child age five, child age nine, and child age 15. Further details about the FFCWS are available online (http://www.fragilefamilies.princeton.edu.udel.idm.oclc.org/documentation.asp).

Measures

The current study includes two categorical independent variables (maternal engagement in binge-drinking and maternal marijuana use) and two dependent variables (scores on externalizing and scores on internalizing behaviors of children) across three waves of data: child age 5, child age 9, and child age 15. The study focuses on children between the ages of five and fifteen because 1) we wanted to capture three distinct developmental stages in which children experience multiple developmental transitions both as individuals and within the family (e.g., early childhood, middle childhood, adolescence) and 2) these were the waves in which the measures of interest were available in the FFCWS dataset.

Children's Externalizing and Internalizing Behaviors

Children's externalizing (e.g., aggression) and internalizing (e.g., depression, anxiety) symptoms were assessed at each wave (child age five, child age nine, and child age 15) using maternal reports on items from the age-appropriate Child Behavior Checklist (CBCL/4-18, Achenbach, 1991; CBCL/6-18, Achenbach & Rescorla, 2001), a well-validated and commonly used measure of children's behavioral functioning. The CBCL asks parents to respond on a 0–2 scale (0, never true; 1, sometimes or somewhat true; or 2, very true or often true). The CBCL internalizing subscale captures anxiety, depression, withdrawal, and somatic complaints; the externalizing subscale captures aggression, destructive behaviors, and rule breaking. In the child age

five wave, the FFCWS measure of Child Behavior Problems includes 72 of 113 items from the original CBCL/4-18. Items related to somatic problems and other questions not applicable for very young children were excluded from the child age five wave measure. In the nine-year wave data, the FFCWS measure of Child Behavior Problems includes 111 of 118 items from the original CBCL/6-18. Items related to somatic complaints were included in the data collection but excluded from the analysis because these items were only included in the nine-year wave. In the 15-year wave measure of Teen Behavior Problems, 34 of 118 items from the original CBCL/6-18 were included. Children's developmental trajectories change across time and therefore the CBCL asks different questions at different stages to reflect these differences. Additionally, the CBCL underwent revisions during the FFCWS longitudinal study, therefore different versions of the CBCL were administered at each timepoint: at age 5, questions from the CBCL/4-18 (Achenbach, 1991) were administered; at age 9 and 15, questions from the CBCL/6-18 (Achenbach & Rescorla, 2001) were administered. Despite the differences across versions, the constructs that were assessed remained the same (i.e. externalizing and internalizing; Kuckertz, Mitchell, and Wiggins, 2017). For the purposes of this paper, items were cross-checked across the three waves and after removing items that were not included across all three waves, 26 items (18 externalizing and 8 internalizing) were included in the analysis. The following are examples of included internalizing and externalizing items, respectively: *"Child is unhappy, sad, or depressed;"* (Internalizing); *"Child destroys things belonging to family or others"* (Externalizing). Raw externalizing and internalizing scores were summed for each individual at each time point with higher scores indicating worse behavior. Raw scores were used in the latent class growth models and then converted

to T-scores to assess whether the identified externalizing and internalizing trajectories fell within the normal, borderline, or clinical ranges.

Binge-drinking

Maternal binge-drinking was measured across two waves (child age five and child age nine). Frequency of binge-drinking was assessed using the following question: *"In the past 12 months, how often did you have four or more drinks in one day?"* The response categories included the following: 1 = *Every day or almost every day;* 2 = *A few times a week;* 3 = *A few times a month;* 4 = *About once a month;* and 5 = *Less than once a month.*

In the current study, a mother was classified as being a binge-drinker if she reported "having four or more drinks in one day" at least once per month. This cut-off is consistent with the National Institute of Alcohol Abuse and Alcoholism's (NIAAA) definition for binge drinking (four or more drinks for women within a two hour period) and the Substance Abuse and Mental Health Services Administration's (SAMHSA) definition for binge drinking (four or more drinks for women on one occasion within a one month period (NIAAA, 2017). To match the current study's definition of binge-drinking, the item responses were re-coded as a dichotomous measure: 0 = *Not Binge-drinking* and 1 = *Binge-drinking.* Therefore, the original response items were recoded as follows:

- 1 (Every day or almost every day) = 1 (Binge-drinking),
- 2 (A few times a week) = 1 (Binge-drinking),
- 3 (A few times a month) = 1 (Binge-drinking),
- 4 (About once a month) = 1 (Binge-drinking), and

- 5 (Less than once a month) = 0 (Not Binge-drinking).

Marijuana Use

Maternal marijuana use was measured across two waves (child age five, child age nine). Frequency of maternal use of marijuana was assessed using the following question: "During the past twelve months did you use Marijuana or hashish?" Responses were coded as dichotomous variables, 0 = *No*, 1 = *Yes*. At the time of data collection, marijuana was considered an illicit drug.

Covariates

Covariates were selected for inclusion based on their potential correlation with child behavioral problems. The following child and maternal socio-demographic characteristics were included as covariates in the current study's analyses: focal child's gender (0 = *Boy*, 1 = *Girl*), mother's race (0 = *White, non-Hispanic*; 1 = *Black, non-Hispanic*; 2 = *Hispanic*; 3 = *Other*), maternal education (0 = *Less than High School*, 1 = *HS degree or equivalent*, 2 = *Some college or tech*, 3 = *College or graduate school*), and marital status (0 = *Not married*, 1 = *Married*). Means and standard deviations for children's externalizing and internalizing scores are presented in Table 2.

Analytic Approach

Latent Class Growth Analysis

Time is a key factor in understanding how developmental processes unfold. Observations collected across time are not independent, an assumption required of traditional longitudinal analytic methods (e.g., analysis of variance [ANOVA], analysis of covariance [ANCOVA]) (Dimitrov & Rumrill, 2003; Wright, 2006). The

objective of longitudinal analytic approaches used to study families' developmental trajectories is to gather information about inter-individual differences within intra-individual change across time, a goal that is best pursued within the RDS theoretical framework of Lifespan Development. A fundamental tenet of the lifespan development perspective involves acknowledgement of the heterogeneity that exists across individuals' developmental trajectories, necessitating the use of methods of measurement that allow for such differences (Lerner, Hershberg, Hilliard, & Johnson, 2015). In recent years, growth curve modeling (GCM) has emerged as a methodological alternative to analyzing longitudinal data. GCM transcends traditional methods in that it does a better job of accounting for correlated errors frequently associated with longitudinal data and in so doing provides results that are more accurate and trustworthy (Feingold, 2009; Singer & Willett, 2003).

Studying the behaviors and conditions that act as agents of change in the developmental process is a complex task. If one is interested in exploring problem behaviors then the task becomes all the more difficult. Problem behaviors (e.g., substance abuse, psychopathology) are often non-normative and, as such, violate assumptions of standard normal-theory linear models (Feldman, Masyn, & Conger, 2009). However, much research treats non-normal data as normal, which can lead to biased estimates, incorrect standard errors, and incorrect fit statistics even when the data are symmetric (Feldman, Masyn, & Conger, 2009; West, Finch, & Curran, 1995). In the past few decades, analytic approaches like SEM and Growth Modeling have been used as mechanisms to address these issues of normality. Latent Class Growth Analysis and Growth Mixture Modeling are two strong examples of analytics

approaches capable of fully capturing inter-individual differences (i.e. problem behaviors) within larger populations (Jung & Wickrama, 2008).

Latent Class Growth Analysis is a subset of Growth Mixture Modeling that takes into account the natural heterogeneity that exists within a population by grouping individuals according to the similarity and shape of their trajectories (e.g., constant, quadratic) and estimating the proportion of individuals belonging to each trajectory (Duchesne, Larose, Vitaro, & Tremblay, 2010). Latent class growth analysis extended the conventional growth model framework by combining latent growth curve analysis with latent class analysis. Latent growth mixture modeling (Muthén, 2001a, 2001b; Muthén & Shedden, 1999) is the most versatile approach to studying trajectories of growth. It examines between class differences within intraindividual change across time, providing a more accurate representation of the data than conventional methods. In order to understand the effects that maternal substance use has on children's developmental mental health outcomes, we must first identify the developmental trajectories of internalizing and externalizing behavior across time, making latent class growth analysis (LCGA) an ideal analytic choice for addressing the primary aim of the current study. The goal of LCGA is to identify trajectories of groups based on the patterns of change in an observed variable across time. Each group, or class, has a different developmental trajectory such that individuals in a class are maximally similar to one another (within groups) across time, and maximally different from individuals in other groups/classes (between groups) (Muthén, 2001a, 2001b; Muthén & Shedden, 1999; Kim, 2014; Nagin, 1999; Jung & Wickrama, 2008).

The first aim of the study was to classify individuals based on their development of externalizing and internalizing symptoms from early childhood to

adolescence using an unconditional model (no covariates or predictors). Two unconditional LCGA models were estimated with one to six classes (Jung & Wickrama, 2008) to identify latent developmental trajectories for children's externalizing (Model 1, see Figure 1) and internalizing (Model 2, see Figure 2) behaviors. The models were constructed using externalizing and internalizing behavior scores collected across three waves: child age five, child age nine, and child age 15. Following established procedures outlined by Jung & Wickrama (2008) as well as a similar study conducted by Wiggins and colleagues (2015), Mplus 8.1 (Muthén & Muthén, 2012-2017) was used to estimate models. Next, the best-fitting model was selected based on interpretability and a variety of fit indices including: Akaike Information Criterion (AIC; Akaike, 1987), Bayseian Information Criterion (BIC; Schwarz, 1978), the sample-size adjusted BIC (SSABIC; Sclove, 1987), the Lo-Mendell-Rubin likelihood ratio test (LMR-LRT; Lo, Mendell, & Rubin, 2001), the Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMR; Lo, Mendell, & Rubin, 2001; Vuong, 1989), bootstrap likelihood ratio (BLRT; McLachlan & Peel, 2000), entropy, and a minimum class size of 1%.

A significant *p*-value from the LMR or BLRT indicates the model with the larger number of groups (*k* classes) should be preferred over the model with the smaller number of groups (*k*-1 classes; Nylund, Asparouhov, & Muthén, 2007). In larger sample sizes, the model with the lowest AIC, BIC, and/or SABIC is considered to be the best-fitting outcome and it is recommended that classes from this solution be retained (Morgan, 2015; Nylund et al., 2007; Yang, 2006). To avoid local maxima, some models needed to be run with 500 to 1,000 random starts (Jung & Wickrama, 2008; Wiggins et al., 2015). Once the best-fitting model was identified, both models

were re-run with the covariates (maternal race, child sex, maternal education, and marital status). Figures 1 and 2 present visual representations of the externalizing and internalizing LCGA models.

LCGAs included data about children's behaviors as reported by their mothers across multiple time points (child age 5, child age 9, child age 15). The unconditional model employed random starts and was estimated using full information maximum likelihood (FIML). Missing data are common in large-scale longitudinal studies (Bryant, Schulenberg, O'Malley, Bachman, & Johnston, 2003; Puma, Olsen, Bell & Price, 2009). FIML overcomes this problem by using all available data to estimate all parameters and by allowing subjects who drop out to be included in the analysis (Heron, Hickman, Macleod, & Munafò, 2011; Enders, 2001; Enders & Bandalos, 2001). FIML has been shown to be accurate when data are missing at random (i.e. the drop-out rate is MAR; Peugh & Enders, 2004), as well as when data are not missing at random (NMAR; cf. Enders, 2011; Muthén et al, 2011, for further elaboration on the accuracy of FIML when data are NMAR).

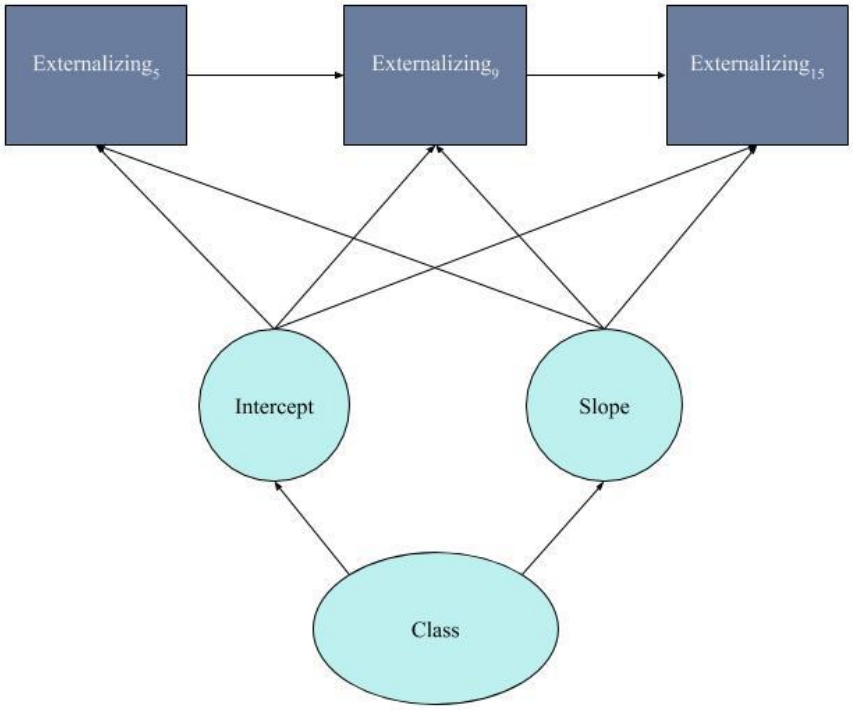

Figure 1 Latent Class Growth Analysis Representation for Externalizing Class

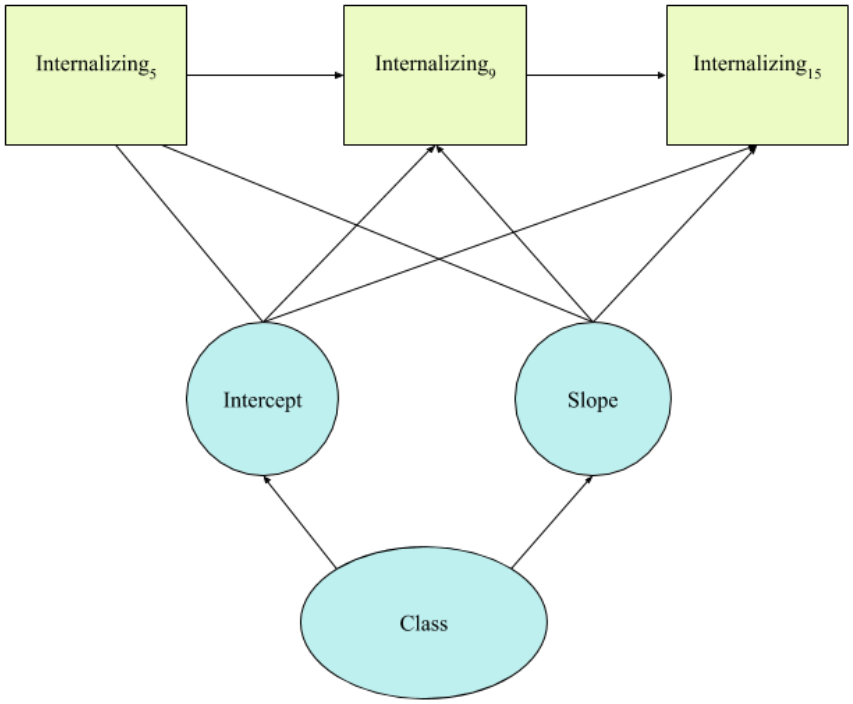

Figure 2 Latent Class Growth Analysis Representation for Internalizing Class.

The goal of the second aim was to examine whether moderate types of maternal substance use predicted children's development of internalizing and externalizing behaviors across time. Following the three-step method (Asparouhov & Muthén, 2014), latent classes were regressed on the explanatory demographic covariates while accounting for measurement error in posterior classifications. Each model held the covariates as simultaneous binary explanatory variables, including mother's race (0 = *White, non-Hispanic*; 1 = *Black, non-Hispanic*; 2 = *Hispanic*; 3 = *Other*) and focal child's gender (0 = *Boy*, 1 = *Girl*), maternal education (0 = *Less than*

High School, 1 = *HS degree or equivalent*, 2 = *Some college or tech*, 3 = *College or graduate school*), and marital status (0 = *Not married*, 1 = *Married*) in a multinomial logistic regression model using the general logit link function.

Then, to examine whether maternal substance use was predictive of class membership across the trajectories for the externalizing and internalizing models, the classes identified from aim 1 were regressed on the substance use variables in a multinomial logistic regression model using the logit link function. Using multinomial logistic regression within a conditional LCGA enabled class membership predictions by using posterior probabilities to assign each individual fractionally to all classes, as opposed to forcing a binary (0/1) classification (Muthén, 2004). This is important to note as it is unlikely that any one participant has a 100% probability of membership in a particular class. If multinomial logistic regressions were to be run separate from the LCGA model then these regressions would not actually be predicting trajectory class, they would instead be predicting "most likely" membership in trajectory class. By employing multinomial logistic regression within a conditional LCGA framework, the present models directly account for this error (Muthén, 2004).

The variables in the model included the time-varying substance use variables (maternal binge drinking, maternal marijuana use at child ages 5 and 9) and child behavioral outcomes (externalizing, see figure 3; internalizing, see figure 4) while controlling for the sociodemographic variables. Class probabilities for both models were exported into SPSS version 25.0 for further analysis; comparisons using

descriptive analyses were conducted to examine frequencies of class membership across the predictors for both externalizing and internalizing models.

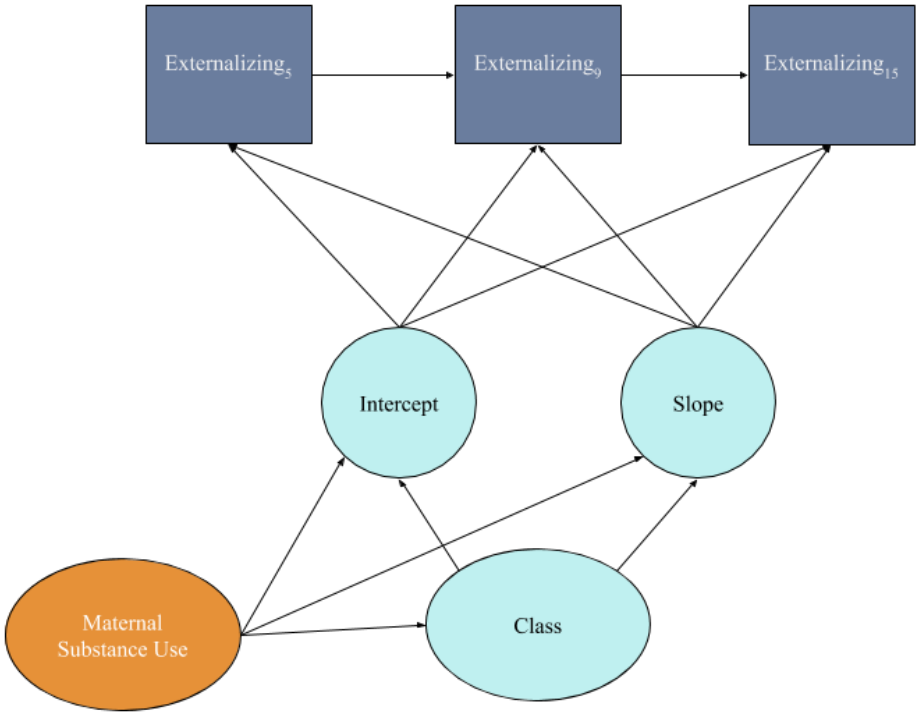

Figure 3 Conditioned LCGA Model for Externalizing Scores with Substance Use Predictors

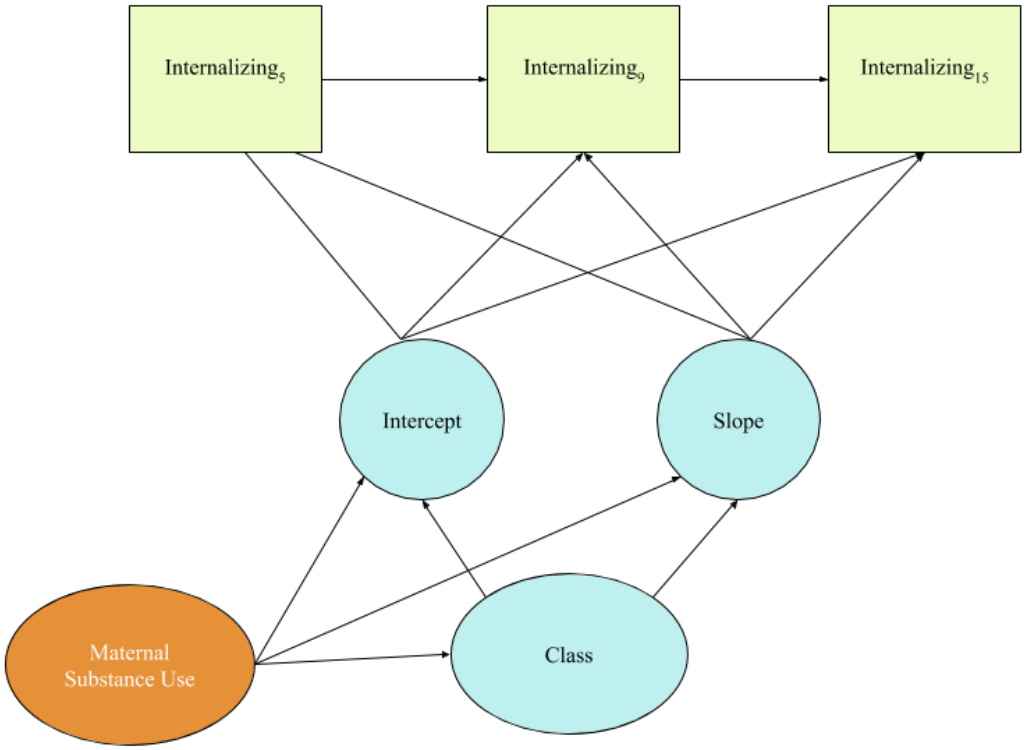

Figure 4 Conditioned LCGA Model for Internalizing Scores with Substance Use Predictors

Chapter 4

RESULTS

Descriptive Statistics

The respondents in the sample are primarily mothers who are unmarried and qualify as low socioeconomic status. A large proportion of the sample identified as racial and/or ethnic minorities (74.6%) and were not married to their child's father (67.4%). A summary of the sample characteristics can be found in Tables 1 - 2. Of the 2,189 mothers who reported their education level, approximately 656 (30%) reported not graduating from high school, a little over 30% of mothers in the sample reported earning a high school diploma or the equivalent (i.e. GED), 27% reported attending some college, and less than 12% reported earning either a baccalaureate or graduate-level degree. Fewer mothers reported drinking when their children were five (n = 143, 6.5%) than when their children were nine (n = 174, 8.2%). A similar difference was evidenced for marijuana use. When children were five, 43 (2%) mothers reported using marijuana whereas when children were nine, 63 (3%) mothers reported using marijuana (see Table 1). Raw scores, means, and standard deviations are reported for each measure in Table 2 as well as the number of children who obtained T-scores greater than 60 are listed, which according to Achenbach (1991) denotes scores in the borderline clinical range.

Table 1 Descriptives of Independent Variables

	N	%
Child's Biological Sex	***2,191***	
Male	1,133	51.7
Female	1,058	48.3
Maternal Race	***2,186***	
White, non-Hispanic	485	22.2
Black, non-Hispanic	1,137	52.0
Hispanic	495	22.6
Other	69	3.2
Level of Maternal Education	***2,189***	
< High School	654	30.0
High School/GED	685	31.3
Some College	591	27.0
College or Graduate	259	11.8
Mother's Relationship to Father	***2,152***	
Not Married	1,451	67.4
Married	701	32.6
Maternal Binge-drinking		
Child age 5	***2,189***	
Not binge-drinking	2,046	93.5
Binge-drinking	143	6.5
Child age 9	***2,127***	
Not binge-drinking	1,953	91.8
Binge-drinking	174	8.2
Maternal Marijuana Use		
Child age 5	***2,190***	
No marijuana use	2,147	98.0
Marijuana use	43	2.0
Child age 9	***2,125***	
No marijuana use	2,062	97.0
Marijuana use	63	3.0

Note. Sample sizes and percentages are reported for each of the predictor variables.

Table 2 Means and Standard Deviations of Children's Externalizing and Internalizing Scores

	N	CBCL M(SD)	Range	# (%) T > 60
Children's Externalizing Scores				
Child age 5	2,191	5.14 (4.04)	0 – 23	290 (13%)
Child age 9	2,050	3.12 (3.84)	0 – 35	290 (14%)
Child age 15	2,191	4.25 (4.66)	0 – 31	337 (15%)
Children's Internalizing Scores				
Child age 5	2,191	1.45 (1.71)	0 – 11	38 (2%)
Child age 9	2,050	1.18 (1.79)	0 – 16	38 (2%)
Child age 15	2,191	2.07 (2.50)	0 – 15	59 (3%)

Note. Raw scores, means, and standard deviations are reported for each measure. Number (#) and row percentage (%) obtaining T-scores greater than 60 are listed; CBCL = Child Behavior Checklist; all numbers rounded at second decimal point for convenient presentation.

Aim 1: Classify Individuals' Development of Externalizing and Internalizing Symptoms from Early Childhood to Adolescence

Externalizing

Three classes served as the best fit for the externalizing model. Table 3 contains the fit indices for each of the six models (one through six classes) that were run for externalizing symptoms. AIC, BIC, and SSABIC values consistently decreased with the addition of each class, indicating a better model fit with more classes, which is often the case with large samples (Wiggins et al., 2015). The LMR-LRT statistic decreased with the addition of each class, and the LMR-LRT *p*-value was significant for all models except the four-class and five-class models. The BLRT *p*-value was significant for all classes except the five-class wherein the best loglikelihood value did not replicate, meaning the BLRT value was not reliable. Entropy values (i.e. degree of class separation) were consistently large (> 0.86) for two through six classes,

indicating high classification accuracy across all models. And, in all models, each of the smallest latent classes were greater than 1% of the sample (a cut-off for the smallest acceptable class size; Jung & Wickrama, 2008). According to Muthén (2011), there is no fixed rule regarding the minimum percentage of classes; the minimum percentage is relative to the overall sample size and a large sample allows for smaller percentages.

Table 3 Fit statistics for Externalizing Models

	No. of Classes				
	2	**3**	4	5	6
Externalizing					
AIC	33026.40	**32827.74**	32664.61	32558.28	32446.18
BIC	33077.07	**32895.30**	32749.06	32659.59	32564.40
SSABIC	33048.47	**32857.17**	32701.40	32602.40	32497.68
LMR-LRT Statistic	578.665	**196.091**	162.052	107.652	113.131
LMR-LRT *p* value	0.0005	**0.0084**	0.0572	0.1615	0.0396
BLRT *p* value	0.0001	**0.0001**	0.0001	N/A	0.0001
Entropy	0.917	**0.887**	0.889	0.884	0.861
Smallest Latent Class	0.098	**0.032**	0.033	0.022	0.022

Note. Values in bold indicate the selected model; the three-class model was accepted over the four-class based on a combination of fit indices and interpretability. AIC = Akaike Information Criterion; BIC = Bayseian Information Criterion, SSABIC = sample-size adjusted BIC, LMR-LRT = Lo-Mendell-Rubin likelihood ratio test; the Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMR; Lo, Mendell, & Rubin, 2001; Vuong, 1989), bootstrap likelihood ratio (BLRT; McLachlan & Peel, 2000); the best loglikelihood value for the five-class model did not replicate, meaning the BLRT value was not reliable and therefore not included.

While the AIC, BIC, and SSABIC values indicated that the six-class was the best fitting model, the entropy value consistently decreased with the addition of each class indicating poorer model fit. Therefore, the six-class model was not selected. Further, the intercepts and slopes in the six-class model were not distinct from one another at each timepoint, making interpretation of the classes difficult and potentially

less reliable. The LMR-LRT *p*-value for both the five-class and four-class models were not significant. Thus, the four-class and five-class models were not selected.

After considering all model fit indices, the three-class model was selected as the best fit. The significant LMR *p*-value, which indicates that the model with the larger number of groups (*k* classes) should be preferred over the model with the smaller number of groups (*k*-1 classes; Nylund et al., 2007), in the three-class model ($p = 0.0071$) indicated that the three-class model was a better fit than the two-class. Further, the intercepts and slopes of the three-class model were distinct from one another at each time point, which contributes to the interpretability of the model. The entropy level was high (0.89) and the proportion of the smallest latent class was above 1% (0.03). As stated previously, when determining the number of classes, fit indices are to be considered along with one's research question, parsimony, theoretical justification, and interpretability (Jung & Wickrama, 2008). Thus, the three-class model was accepted as best fitting and rerun with the control variables. Figure 3 contains a graphical depiction of the trajectories for each of the classes in all of the models run for externalizing trajectories. Table 4 shows the estimated intercepts and slopes for each externalizing class.

Table 4 Estimated Intercepts and Slopes for 3-class Externalizing models

	N (%)	Intercept	Slope
Externalizing			
Normal-stable	1642.5 (80%)	3.91**	-0.16**
Normal-to-borderline	348.8 (17%)	6.46**	0.324**
Normal-to-clinical	66.7 (3%)	7.17**	1.20**

Note. *$p < .01$, **$p < .001$; normal-stable: at age 5, children demonstrated normal levels of externalizing behavior (< 60) that remained stable (i.e. below clinical cutoff) throughout middle childhood and adolescence; normal-to-borderline: at age 5, children demonstrated normal levels of externalizing behavior that increased to borderline (60 – 63) during middle childhood and remained stable at borderline levels throughout adolescence; normal-to-clinical: at age 5, children demonstrated normal levels of externalizing behavior that increased to clinical levels (> 63) in middle childhood and continued to increase throughout adolescence.

The development of externalizing symptoms was best described by three classes (see Figure 5). The largest, making up 80% of the sample, demonstrated a low-decreasing symptoms trajectory, which remained stable in middle childhood and slightly decreased throughout adolescence. This class was characterized by low levels of externalizing scores (< 60), considered to be in the normal range (Achenbach, 1991), and was therefore labeled the normal-stable symptoms class. The normal-to-borderline symptoms class, encompassing 17% of the sample, was marked by initial normal levels (< 60) that remained relatively stable through middle childhood and then increased to borderline-clinical levels (60-63; Achenbach, 1991) of externalizing scores in adolescence. The smallest class made up only 3% of the sample and was

labeled the normal-to-clinical symptoms class. This class was marked by normal levels (< 60) of externalizing scores that increased to clinical levels (> 63; Achenbach, 1991) in middle childhood and continued to increase throughout adolescence. The normal-to-borderline and normal-to-clinical symptoms classes had similar levels of externalizing problems at age 5. However, they differed in terms of slope: the normal-to-clinical symptoms class exhibited a steeper incline from middle childhood to adolescence, while the normal-to-borderline symptoms class remained relatively constant throughout middle childhood and adolescence.

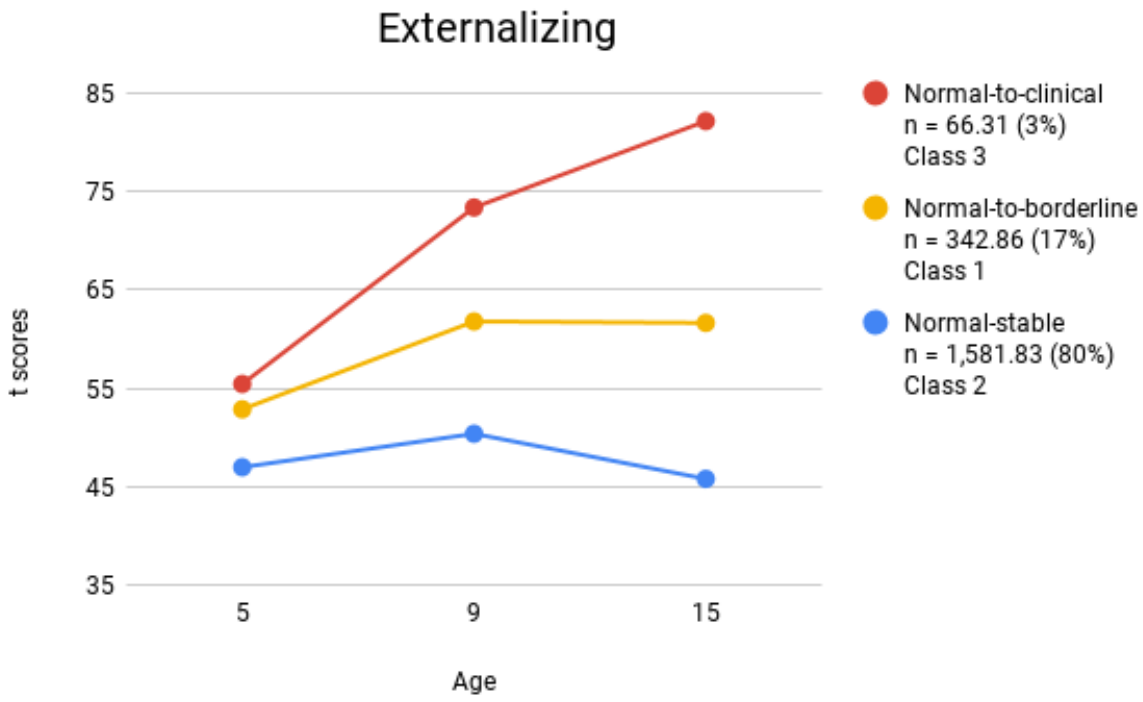

Figure 5 Estimated Growth Trajectories for Externalizing Scores

N=1,991; Normal-to-clinical symptoms class = 3%; Normal-to-borderline symptoms class = 17%; Normal-stable class = 80%. Analyses controlled for maternal race, child sex, maternal education, and marital status. Raw scores were converted to T-scores (standardized scores). Clinical cut-off for borderline symptoms are T-scores within the 60 – 63 range; clinical cut-off for clinical symptoms are T-scores > 63.

Internalizing

Three classes also provided the best fit for the internalizing symptoms model. Table 5 contains the fit indices for each of the six models (one through six classes) that were run for internalizing symptoms. Similar to the fit indices for the externalizing models, the AIC, BIC, and SSABIC consistently decreased across all models with the exception of the six-class model, which was not identified (meaning one best value exists for each parameter in the model whose value is not known).

Entropy values were consistently high (> 0.88) for two through six classes, indicating high classification accuracy across all models. The LMR-LRT *p*-value was significant for the two-, three-, five-, and six-class models, however the BLRT *p*-value was only significant for the two-, three-, and six-class models, but because the six-class model was not identified only the two- and three-class models were considered.

Table 5 Fit statistics for Internalizing Models

	No. of Classes				
	2	**3**	4	5	6
Internalizing					
AIC	24412.67	**24042.83**	23838.56	23630.90	23630.90
BIC	24457.71	**24104.75**	23917.37	23726.60	23749.49
Sample Adjusted BIC	24432.29	**24069.80**	23872.90	23672.59	23685.95
LMR-LRT Statistic	1039.87	**360.11**	201.46	204.72	209.09
LMR-LRT *p*-value	0.0001	**0.0040**	0.1208	0.0030	0.0026
BLRT *p*-value	0.0001	**0.0001**	N/A	N/A	0.0001
Entropy	0.906	**0.906**	0.891	0.897	0.907
Smallest latent class	0.11	**0.07**	0.04	N/A	0.00

Note. Values in bold indicate the selected model; the three-class was accepted over the four-class based on a combination of fit indices and interpretability. AIC = Akaike Information Criterion; BIC = Bayseian Information Criterion, SSABIC = sample-size adjusted BIC, LMR-LRT = Lo-Mendell-Rubin likelihood ratio test; the Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMR; Lo, Mendell, & Rubin, 2001; Vuong, 1989), bootstrap likelihood ratio (BLRT; McLachlan & Peel, 2000); the best loglikelihood for the four- and five-class models did not replicate, meaning their *p*-values are unreliable; the six-class model was not identified and therefore LMR and BLRT *p*-values along with other fit statistics may be unreliable.

Since the model with more classes should be preferred over the model with fewer classes if the LMR *p*-value is significant, the three-class model ($p = 0.0033$) proved to be a better fit than the two-class (Jung & Wickrama, 2008). In all models, each of the smallest latent classes were greater than 1% of the sample (see Wiggins et al., 2015; Jung & Wickrama, 2008). Given that determining classes should be the

result of considering fit indices along with other factors (i.e. research question, parsimony, theoretical justification, and interpretability), the three-class model was accepted as best fitting and rerun with the control variables. Figure 6 contains a graphical depiction of the trajectories for the three-class internalizing model. Table 6 shows the estimated slopes and intercepts for each class.

Table 6 Estimated Intercepts and Slopes for 3-class Internalizing models

	N (%)	Intercept	Slope
Internalizing			
Normal-stable	1718.6 (84%)	0.98**	0.02*
Normal-to-clinical	192.71 (9%)	1.46**	0.5**
Clinical-to-normal	141.6 (7%)	5.33**	-1.83**

Note. *$p < .01$, **$p < .001$. Normal-stable: at age 5, children demonstrated normal levels of internalizing behavior (< 60) that remained relatively stable throughout middle childhood and adolescence. Normal-to-clinical: at age 5, children demonstrated normal levels (< 60) of internalizing behavior that increased to borderline (60 – 63) levels in middle childhood and continued to increase to clinical levels (> 63) throughout adolescence. Clinical-to-normal: at age 5, children demonstrated clinical levels of internalizing behaviors (> 63; Achenbach, 1991) that decreased gradually throughout middle childhood to normal levels (< 60; Achenbach, 1991) in adolescence.

All three classes were relatively distinct from one another in terms of both intercepts and slopes at each time point (see Table 6). The largest class, making up 84% of the sample, demonstrated a low-stable trajectory and was therefore labeled the normal-stable symptoms class. In early childhood, this class was marked by low levels

of internalizing scores considered to be in the normal range (< 60; Achenbach, 1991) that remained relatively stable throughout middle childhood and adolescence. The normal-to-clinical class, encompassing 9% of the sample, was marked by low initial levels in the normal range (< 60; Achenbach, 1991) that increased to borderline (60-63; Achenbach, 1991) in middle childhood and continued to increase to the clinical range (> 63) in adolescence. The smallest class made up only 7% of the sample and was labeled the clinical-to-normal symptoms class. This class was characterized by initial high levels of internalizing scores (> 63; Achenbach, 1991) in early childhood, considered to be in the clinical range (Achenbach, 1991). These levels decreased in middle childhood and continued to decrease throughout adolescence to the normal range (< 60; Achenbach, 1991).

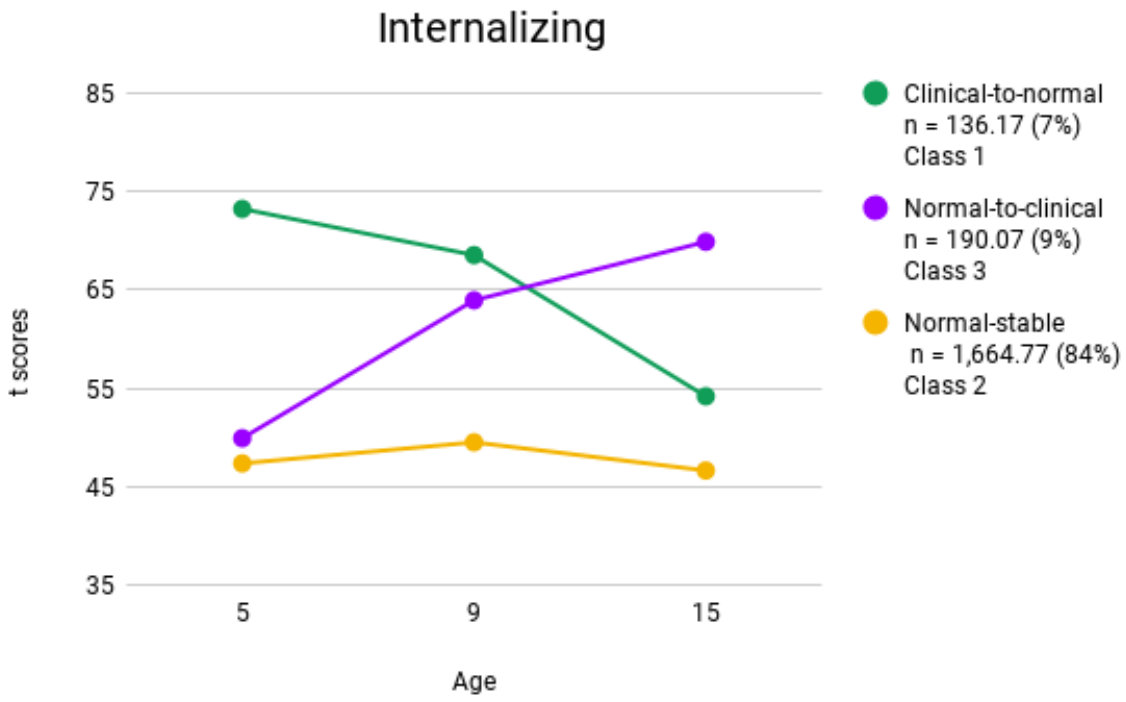

Figure 6 Estimated Growth Trajectories for Internalizing Scores. N=1,991; Clinical-to-normal symptoms class = 7%; Normal-to-clinical symptoms class = 9%; Normal-stable class = 84%. Analyses controlled for maternal race, child sex, maternal education, and marital status**.** Raw scores were converted to T-scores (standardized scores).

Aim 2: Examine Whether Maternal Binge Drinking and Marijuana Use Predict Children's Externalizing and Internalizing Trajectories

After determining the number of classes for each of the externalizing and internalizing models, the models were re-run with the time-invariant control variables using the three-step method (Asparouhov & Muthén, 2014). Fit statistics were compared to the unconditional model and results confirmed that, overall, model fit improved with the addition of the covariates (see Tables 7 and 8). Next, the substance use predictors were added to the model and results confirmed that they provided predictive value in class membership above and beyond that which was accounted for

by the sociodemographic variables alone (Asparouhov & Muthén, 2014). Participants with missing values are dropped by Mplus in growth mixture model estimates (Huang, Brecht, Hara, & Hser, 2010), therefore 206 participants were dropped from the final analyses.

Table 7 Fit statistics for Unconditional and Conditional Three-class Externalizing Models

	Latent Class Growth Analysis Models			
	3-class Unconditional Model	3-class Conditional Model w/ Covariates	3-class Conditional Model w/ Substance Use Predictors	3-class Conditional Model w/ Covariates and Substance Use Predictors
Fit Indices				
AIC	32827.74	32739.86	31941.933	31941.93
BIC	32895.30	32807.38	32053.80	32053.80
SSABIC	32857.17	32769.25	31990.26	31990.26
LMR-LRT Statistic	194.27	194.27	195.27	195.27
LMR-LRT *p*-value	0.0090	0.0090	0.0096	0.0096
BLRT *p*-value	0.0001	0.0001	0.0001	0.0001
Entropy	0.887	0.888	0.887	0.887
Smallest latent class	0.032	0.033	0.033	0.033

Note. Values in bold indicate the selected model. AIC = Akaike Information Criterion; BIC = Bayseian Information Criterion, SSABIC = sample-size adjusted BIC, LMR-LRT = Lo-Mendell-Rubin likelihood ratio test; the Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMR; Lo, Mendell, & Rubin, 2001; Vuong, 1989), bootstrap likelihood ratio (BLRT; McLachlan & Peel, 2000).

Table 8 Fit statistics for Unconditional and Conditional Three-class Internalizing Models

	Latent Class Growth Analysis Models			
	3-class Unconditional Model	3-class Conditional Model w/ Covariates	3-class Conditional Model w/ Substance Use Predictors	3-class Conditional Model w/ Covariates and Substance Use Predictors
Fit Indices				
AIC	24042.83	23925.12	23323.77	23323.77
BIC	24104.75	23992.64	23435.64	23435.64
SSABIC	24069.80	23954.51	23372.10	23372.10
LMR-LRT Statistic	360.11	403.33	393.20	393.20
LMR-LRT *p*-value	0.0040	0.0001	0.0013	0.0013
BLRT *p*-value	0.0001	0.0001	0.0001	0.0001
Entropy	0.906	0.904	0.903	0.903
Smallest latent class	0.068	0.067	0.072	0.072

Note. Values in bold indicate the selected model. AIC = Akaike Information Criterion; BIC = Bayseian Information Criterion, SSABIC = sample-size adjusted BIC, LMR-LRT = Lo-Mendell-Rubin likelihood ratio test; the Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMR; Lo, Mendell, & Rubin, 2001; Vuong, 1989), bootstrap likelihood ratio (BLRT; McLachlan & Peel, 2000.

Externalizing

Separate conditional models were run using the externalizing and internalizing trajectories identified in aim 1. These models used multinomial logistic regressions to test whether maternal substance use was significantly predictive of class membership

across children's externalizing and internalizing trajectories. Results for the conditional externalizing model showed that maternal binge-drinking at child age five was significantly predictive of class membership in the normal-to-borderline class relative to the normal-stable class (OR = 1.994; $p = 0.009$); meaning, children whose mothers engaged in binge-drinking when they were five were 1.9 times more likely to be in the normal-to-borderline class than the normal-stable class. At child age nine, maternal binge-drinking did not predict class membership for the normal-to-borderline class, however maternal marijuana use did; children whose mothers used marijuana when they were nine were 2.4 times more likely to be in the normal-to-borderline class than the normal-stable class (OR = 2.401; $p = 0.021$). Maternal substance use was not significantly predictive of class membership in the normal-to-clinical trajectory class or the normal-stable class (see Table 9).

Table 9 Multinomial Logistic Regressions: Odds Ratio (OR) Estimates for Substance Use Variables Predicting Class Membership for Externalizing Models

Predictor	**Externalizing**			
	Normal-to-borderline		***Normal-to-clinical***	
	Estimate (SE)	OR	Estimate (SE)	OR
Normal-stable				
Maternal Binge-drinking				
Child age 5	**0.69 (0.27)****	**1.99**	0.42 (0.50)	1.52
Child age 9	0.16 (0.27)	1.18	0.51 (0.42)	1.67
Maternal Marijuana Use				
Child age 5	0.56 (0.58)	1.75	1.28 (0.70)	3.58
Child age 9	**0.88 (0.38)***	**2.40**	0.31 (0.83)	1.36
Normal-to-borderline				
Maternal Binge-drinking				
Child age 5			-0.27 (0.54)	0.76
Child age 9			0.35 (0.49)	1.42
Maternal Marijuana Use				
Child age 5			0.71 (0.85)	2.04
Child age 9			-0.57 (0.91)	0.57

Note: The classes in the left column are the reference categories; *$p < .05$, **$p < .01$; SE = Standard Error; all values rounded to second decimal position for convenient presentation.

Internalizing

Results for the conditional internalizing model revealed that maternal binge-drinking at child age 5 was significantly predictive of class membership in both the normal-to-clinical and clinical-to-normal classes. This means that children whose mothers engaged in binge-drinking, at child age 5, were 1.9 times and 2.6 times more likely to be classified in the normal-to-clinical (OR = 1.904; $p = 0.046$) and clinical-to-normal (OR = 2.556; $p = 0.007$) classes respectively, using the normal-stable class as the reference category (see Table 10).

Table 10 Multinomial Logistic Regressions: Odds Ratio (OR) Estimates for Substance Use Variables Predicting Class Membership for Internalizing Models

Predictor	**Internalizing**			
	Normal-to-clinical		***Clinical-to-normal***	
	Estimate (SE)	OR	Estimate (SE)	OR
Normal-stable				
Maternal Binge-drinking				
Child age 5	**0.64 (0.32)***	**1.90**	**0.94 (0.35)****	**2.56**
Child age 9	0.37 (0.30)	1.44	-0.34 (0.41)	0.71
Maternal Marijuana Use				
Child age 5	0.93 (0.52)	2.53	0.17 (1.11)	1.19
Child age 9	-0.07 (0.52)	0.94	-0.35 (0.75)	0.70
Normal-to-clinical				
Maternal Binge-drinking				
Child age 5			0.30 (0.44)	1.34
Child age 9			-0.71 (0.48)	0.49
Maternal Marijuana Use				
Child age 5			-0.76 (1.23)	0.47
Child age 9			-0.28 (0.93)	0.75

Note. The classes in the left column are the reference categories; *$p < .05$, **$p < .01$; SE = Standard Error; all values rounded to second decimal position for convenient presentation.

Finally, predictors were examined descriptively, assigning individuals in the study sample to their most likely trajectory class and comparing frequencies of predictor variables across classes (see Tables 11-12).

Table 11 Frequencies of Substance Use Variables by Externalizing Class Membership

Characteristics	**Externalizing Class**			
Maternal Substance Use	Normal-to-clinical	Normal-to-borderline	Normal-Stable	Total
	62 (3%)	322 (16%)	1,601 (81%)	1,985 (100%)
Child age 5				
Not Binge-drinking	56 (3.0%)	286 (15.4%)	1,514 (81.6%)	1,856 (100%)
Binge-drinking	6 (4.7%)	36 (27.9%)	87 (67.4%)	129 (100%)
Child age 9				
Not Binge-drinking	53 (2.9%)	289 (15.8%)	1,483 (81.3%)	1,825 (100%)
Binge-drinking	9 (5.6%)	33 (20.6%)	118 (73.8%)	160 (100%)
Child age 5				
Not using marijuana	58 (3.0%)	313 (16.0%)	1,577 (81.0%)	1,948 (100%)
Using marijuana	4 (10.8%)	9 (24.3%)	24 (64.9%)	37 (100%)
Child age 9				
Not smoking	60 (3.1%)	303 (15.7%)	1,562 (81.1%)	1,925 (100%)
Smoking	2 (3.3%)	19 (31.7%)	39 (65.0%)	60 (100%)

Note. Frequencies and row percentages of mothers who engaged in binge-drinking and marijuana use at child ages 5 and 9 are reported by externalizing trajectory class.

Table 12 Frequencies of Substance Use Variables by Internalizing Class Membership

Characteristics	**Internalizing Class**			
Maternal Substance Use	Clinical-to-normal	Normal-to-clinical	Normal-Stable	Total
	131 (7%)	177 (9%)	1,677 (84%)	1,985 (100%)
Child age 5				
Not Binge-drinking	115 (6.2%)	156 (8.4%)	1,585 (85.4%)	1,856 (100%)
Binge-drinking	16 (12.4%)	21 (16.3%)	92 (71.3%)	129 (100%)
Child age 9				
Not Binge-drinking	121 (6.6%)	154 (8.4%)	1,550 (85.0%)	1,830 (100%)
Binge-drinking	10 (6.3%)	23 (14.4%)	127 (79.4%)	160 (100%)
Child age 5				
Not smoking	129 (6.6%)	169 (8.7%)	1,650 (84.7%)	1,948 (100%)
Smoking	2 (5.4%)	8 (21.6%)	27 (73.0%)	37 (100%)
Child age 9				
Not smoking	128 (6.6%)	171 (8.9%)	1,626 (84.5%)	1,925 (100%)
Smoking	3 (5.0%)	6 (10.0%)	51 (85.0%)	60 (100%)

Note. Frequencies and row percentages of mothers who engaged in binge-drinking and marijuana use at child ages 5 and 9 are reported by internalizing trajectory class.

Chapter 5

DISCUSSION

The current study characterized children's development of externalizing and internalizing behaviors from early childhood through adolescence, and examined whether maternal binge-drinking and marijuana use were predictive of these behaviors. Findings showed that children whose mothers reported binge-drinking or marijuana use were more likely to exhibit borderline and/or clinical patterns of externalizing and internalizing behaviors. Findings from the current study are generally consistent with previous empirical (Silver, Measelle, Armstrong, & Essex, 2010; Latendresse et al., 2011; Wiggins et al., 2015) and theoretical (Cicchetti & Rogosch, 1996) research characterizing developmental heterogeneity of children's externalizing and internalizing symptoms. Novel contributions of the current work include its exploration of these symptoms from early childhood through adolescence, as well as the examination of the predictive quality of maternal substance use on children's development.

The first aim of the study was to classify individuals based on their development of externalizing and internalizing symptoms from early childhood to adolescence; separate models were run for externalizing and internalizing symptoms and, for both models, three trajectory groups best represented children's development across time. This finding is generally consistent with previous work on children's externalizing (Latendresse et al., 2011; Moffitt, 1993; Silver et al., 2010; Wiggins et al., 2015) and internalizing (Crocetti et al., 2009; Duchesne et al., 2010; Fanti & Henrich, 2010; Wiggins et al., 2015) behavior trajectories. However, trajectory shape differed between models and across studies. While he shapes of externalizing

trajectories were generally consistent with previous work (see Latendresse et al., 2011; Silver et al., 2010; Wiggins et al., 2015), the shapes of internalizing trajectories in the current study differed from previous work in some unique ways. For instance, the current study identified both a clinical-to-normal and normal-to-clinical group for internalizing behavior. Generally, this pattern was not found across other studies examining children's internalizing behaviors (see Crocetti et al., 2009; Fanti & Henrich, 2010; Wiggins et al., 2015) except for Duchesne et al., 2010 wherein the authors identified both a high-desisting *and* a low-increasing group for internalizing behaviors; they also found that children who are inattentive (as reported by teachers) are more likely to belong to these groups. Duchesne et al. (2010) posited that the severe levels of internalizing behaviors demonstrated by the high-desisting group at age six and normalize in middle childhood may be due to the stress caused by the transition to Kindergarten. This could provide an explanation for the clinical-to-normal behavior pattern found in the current study (clinical-to-normal group). To test the transition-to-kindergarten hypothesis, future work should include additional covariates and consider including teacher reports of children's internalizing behavior to capture a more holistic picture of children's behavior across contexts. Additionally, it may be important to consider that many children from a population sample may have attended childcare prior to attending kindergarten; it would be, therefore, important to include childcare experiences prior to age five.

Previous studies characterizing children's development of externalizing and internalizing behaviors have focused on specific developmental periods including early childhood and middle childhood (Fanti & Henrich, 2010; Silver et al., 2010; Wiggins et al., 2015), middle childhood and adolescence (Duchesne et al., 2010), and

adolescence through young and emerging adulthood (Crocetti et al., 2009; Latendresse et al., 2011). However, prior work has yet to provide a continuous developmental snapshot of how these behaviors evolve and differ from child age five to child age 15 using person-centered methods. To the author's knowledge, this is the first study to classify children's externalizing and internalizing behaviors from child age five to child age fifteen and to examine whether maternal binge-drinking and marijuana use is predictive of membership in these trajectory classes using latent class growth analysis.

Children and their families experience multiple and significant transitions during early childhood and adolescence (e.g., young child's transition to kindergarten; adolescent's transition to high school). Developmental scholars have identified these stages as sensitive periods (see Lerner et al., 2015) due to an individual's increased vulnerability to how stress is experienced during periods of transition (Graber & Brooks-Gunn, 1996). Experiences and skills cultivated during these periods can have lasting impact on a child's life. For example, Jones, Greenberg, & Crowley (2015) found that social competence measured in early childhood serves as a predictor of key young adult outcomes across multiple domains of education, employment, criminal activity, substance use, and mental health. Contrastingly, adverse experiences in early childhood have been shown to lead to negative health outcomes later in childhood (Flaherty, Thompson, & Litrownik, 2006) as well as adulthood (Felitti et al., 1998). Therefore, work exploring predictors of children's developmental trajectories, such as those characterized in the current study, should aim to include sensitive periods (i.e. early childhood and adolescence) in their analyses.

Children of parents who abuse substances are more likely to experience mental health disorders, trauma, and learning disabilities (Lipari & Van Horn, 2017; Staton-

Tindall et al., 2013). Previous studies have focused on extreme patterns of parental problematic substance use (e.g., heavy and disordered drinking), yet much less evidence is available regarding the effects of more moderate patterns of problematic substance use on children's development. The current study found that maternal binge-drinking, an arguably less extreme pattern of problematic drinking, has significant effects on children's externalizing and internalizing behavior trajectories as early as age five.

Additionally, very little research has looked at the effects of maternal marijuana use on children's developmental outcomes. The current study found that maternal marijuana use predicted children's externalizing behavior but was not significantly predictive of children's internalizing behavior. This finding is generally consistent with prior work in this area though the majority of said work has focused on prenatal exposure, which was not assessed in the current study. For example, Day et al. (2006) found that prenatal exposure to marijuana served as a significant predictor of child marijuana use at age 14, and Goldschmidt, Day, & Richardson (2000) found that prenatal exposure to marijuana was not predictive of child internalizing behavior at age 10 but was predictive of child externalizing behavior. Another study by Li et al. (2002) found that parental marijuana use was associated with children's externalizing behavior, namely substance use, however internalizing behavior was not examined. The current study's comparison between marijuana and alcohol addresses the paucity of evidence on the effects of marijuana use. This may be an important contribution given the recent push for recreational marijuana legalization in the U.S. Results of this study indicate that maternal marijuana use may be detrimental for children's mental health, particularly externalizing behaviors.

Limitations and Future Directions

Contributions of this study should be interpreted in light of its limitations. One such limitation is the way in which the substance use predictors were measured. In the current study, binge-drinking and marijuana use were each measured using one item. The binge-drinking item aligned with NIAAA's (2017) and SAMHSA's (2016) definition of binge-drinking for women (four or more drinks on any one occasion within the past 30 days), which allowed for the assessment of whether a mother drank as well as how much she drank. However, the measure does not perfectly align as the item asks mothers if they drank four or more drinks in one day (versus "on one occasion"). The marijuana item in the current study assessed whether or not a mother used marijuana over a 12-month period. With such a conservative measure of marijuana use, it is impossible to ascertain frequency or patterns of use; however, maternal marijuana use at child age nine was nonetheless predictive of children's borderline externalizing behavior trajectories, suggesting that even low levels of maternal marijuana use may be detrimental to children's mental health. Though conservative measures were used to assess maternal substance use, the significant associations found in the current study are all the more robust as a result. These findings provide a starting place for future work; in order to understand the nuanced effects of maternal binge-drinking and marijuana use on children's behavior, future research should employ validated measures that assess both frequency and quantity of use.

Examining the effects of maternal binge-drinking and marijuana use on children's development without considering the mechanisms that link these associations (e.g., maternal mental health, parenting style) runs the risk of oversimplifying a behavior that is otherwise quite complex. Prior work has identified

maternal mental health and parenting style as two factors that are influential in predicting children's behavioral outcomes. Hser and colleagues (2015) found maternal mental health disorders (particularly severe disorders) to be significantly related to children's emotional and behavioral problems (Hser et al., 2015). This variable is important to include because, generally, women are more likely to use substances as a coping mechanism to deal with co-occurring issues, whereas men are more likely to use substances for recreation, or reasons related to sensation-seeking or expectations of social and physical pleasure (Center for Substance Abuse Treatment, 2009). A number of studies have also explored parenting style as a mediator of parental substance use, parental mental health, and children's behavioral outcomes. In a recent study using the Fragile Families longitudinal data set, a small yet statistically significant link was found between maternal and child psychopathology, which was partially explained by depressed mothers' greater use of psychological aggression (Kuckertz et al., 2017). While, the current study does not give insight into the mechanisms linking maternal substance use with children's externalizing and internalizing behaviors, it does provide a fuller picture of how children's externalizing and internalizing behaviors develop over time and what role maternal substance use plays in said development. Future work should look at maternal substance use within the context of other variables (i.e. maternal psychopathology) so that we can better understand how to tailor interventions for mothers and their families.

Finally, the study was limited by only including data reported by the mother. Both children's behaviors and maternal substance use were reported by the mother and therefore the relationships among the variables could be inflated due to common method variance. In the future, this could be addressed by using post hoc strategies

(i.e. confirmatory factor analysis; see Richardson, Simmering, & Sturman, 2009) or by including responses from other informants. However, data for all three time points is not available from non-mother informants so it is not possible to replicate this study with non-mother informants using the same dataset. Future work should consider the common method variance issue and work to include both primary sources (mother self-report) and secondary sources (partner reporting on mother's and children's behaviors).

Chapter 6

CONCLUSION

By using a sophisticated person-centered analysis (i.e. latent class growth analysis) to examine children's externalizing and internalizing behaviors across three developmental stages, the current study provides researchers and practitioners with a more informed understanding of the heterogeneity inherent within children's development. The key contribution of this work is its identification of developmental stages wherein maternal binge-drinking and marijuana use are most predictive of borderline and/or clinical patterns of children's externalizing and internalizing behaviors.

Early childhood and adolescence are two sensitive periods of development in which significant maturation and change occur (Lerner et al., 2015). Developing a better understanding of how these behaviors develop and change from early childhood to adolescence and the role that certain types of maternal substance use play in children's development and when they are most predictive is important for designing tailored interventions and programming that are responsive to the needs of the whole family, inclusive of children, adolescents, and their mothers.

According to the Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration, the vast majority of people who struggle with SUDs are not diagnosed and do not receive treatment (Lipari, Park-Lee, & Van Horn, 2016). Moreover, the people who could provide SUD diagnoses (i.e. primary care physicians and pediatricians) are ill-equipped to diagnose and/or treat SUD. For example, a recent survey of general internists found that less than 10% felt prepared to provide a brief intervention or discuss behavioral treatment

(Wakeman, Pham-Kanter, & Donelan, 2016). Findings from the current study shed light on the effects of maternal binge-drinking and marijuana use on children's externalizing and internalizing behaviors as well as which child developmental stage these substance use behaviors may be most harmful. These insights have implications for primary care physicians and pediatricians who are more likely to provide continuous care for a child from infancy through adolescence. By equipping primary care physicians as well as pediatricians with the knowledge and skills to diagnose and treat maternal SUDs (i.e. via screenings during routine care visits), the severity of children's externalizing and internalizing trajectories could potentially be mitigated. Overall, the current study contributed insights related to whether different types of maternal substance use affect children's development of externalizing and internalizing symptoms as well as the child ages at which these substance use behaviors are most harmful.

REFERENCES

Achenbach, T. M. (1991). *Manual for the Child Behavior Checklist/4 –18 and 1991 profile*. Burlington, VT: University of Vermont.

Achenbach, T. M., & Rescorla, L. (2001). *Manual for the ASEBA School-Age Forms and Profiles*. Burlington, VT: ASEBA.

Akaike, H. (1998). Factor Analysis and AIC. In E. Parzen, K. Tanabe, & G. Kitagawa (Eds.), *Selected Papers of Hirotugu Akaike* (pp. 371–386). New York, NY: Springer New York. https://doi.org/10.1007/978-1-4612-1694-0_29

Anda, R. F., Whitfield, C. L., Felitti, V. J., Chapman, D., Edwards, V. J., Dube, S. R., & Williamson, D. F. (2002). Adverse childhood experiences, alcoholic parents, and later risk of alcoholism and depression. *Psychiatric Services*, *53*(8), 1001–1009. https://doi.org/10.1176/appi.ps.53.8.1001

Asparouhov, T., & Muthén, B. (2014). Auxiliary variables in mixture modeling: Three-step approaches using mplus. *Structural Equation Modeling: A Multidisciplinary Journal*, *21*(3), 329–341. https://doi.org/10.1080/10705511.2014.915181

Baltes, P. B., Reese, H. W., & Lipsitt, L. P. (1980). Life-span developmental psychology. *Annual Review of Psychology*, *31*(1), 65–110. https://doi.org/10.1146/annurev.ps.31.020180.000433

Bates, M. E., & Labouvie, E. W. (1997). Adolescent risk factors and the prediction of persistent alcohol and drug use into adulthood. *Alcoholism: Clinical and*

Experimental Research, *21*(5), 944–950. https://doi.org/10.1111/j.1530-0277.1997.tb03863.x

Blackson, T. C. (1994). Temperament: A salient correlate of risk factors for alcohol and drug abuse. *Drug & Alcohol Dependence*, *36*(3), 205–214. https://doi.org/10.1016/0376-8716(94)90146-5

Brennan, L. M., Shaw, D. S., Dishion, T. J., & Wilson, M. (2012). Longitudinal predictors of school-age academic achievement: Unique contributions of toddler-age aggression, oppositionality, inattention, and hyperactivity. *Journal of Abnormal Child Psychology*, *40*(8), 1289–1300. https://doi.org/10.1007/s10802-012-9639-2

Bryant, A. L., Schulenberg, J. E., O'Malley, P. M., Bachman, J. G., & Johnston, L. D. (2003). How academic achievement, attitudes, and behaviors relate to the course of substance use during adolescence: A 6-year, multiwave national longitudinal study. *Journal of Research on Adolescence*, *13*(3), 361–397. https://doi.org/10.1111/1532-7795.1303005

Center for Substance Abuse Treatment. (2009). *Substance abuse treatment for women* (Treatment Improvement Protocol (TIP) Series, No. 51) (pp. 137–180). Rockville, MD: Substance Abuse and Mental Health Services Administration (US). Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK83257/

Child Trends Databank. (2015). Heavy drinking among parents. Retrieved May 16, 2018, from https://www.childtrends.org/indicators/heavy-drinking-among-parents/

Child Welfare Information Gateway. (2016). *Mandated reporting of child abuse and neglect: A practical guide for social workers*. Washington D.C.: Department of Health and Human Services, Children's Bureau. Retrieved from https://www.childwelfare.gov/pubpdfs/manda.pdf

Cicchetti, D. E., & Rogosch, F. A. (1996). Equifinality and mutifinality in developmental psychopathology. *Development and Psychopathology*, *8*(4), 597–600. https://doi.org/10.1017/S0954579400007318

Conner, S. N., Bedell, V., Lipsey, K., Macones, G. A., Cahill, A. G., & Tuuli, M. G. (2016). Maternal marijuana use and adverse neonatal outcomes: A systematic review and meta-analysis. *Obstetrics & Gynecology*, *128*(4), 713–723. https://doi.org/10.1097/AOG.0000000000001649

Crocetti, E., Klimstra, T., Keijsers, L., Hale, W. W., & Meeus, W. (2009). Anxiety trajectories and identity development in adolescence: A five-wave longitudinal study. *Journal of Youth and Adolescence*, *38*(6), 839–849. https://doi.org/10.1007/s10964-008-9302-y

Day, N. L., Goldschmidt, L., & Thomas, C. A. (2006). Prenatal marijuana exposure contributes to the prediction of marijuana use at age 14. *Addiction*, *101*(9), 1313–1322. https://doi.org/10.1111/j.1360-0443.2006.01523.x

Degenhardt, L., & Hall, W. (2012). Extent of illicit drug use and dependence, and their contribution to the global burden of disease. *The Lancet*, *379*(9810), 55–70. https://doi.org/10.1016/S0140-6736(11)61138-0

DeLucia, C., Belz, A., & Chassin, L. (20010221). Do adolescent symptomatology and family environment vary over time with fluctuations in paternal alcohol impairment? *Developmental Psychology*, *37*(2), 207. https://doi.org/10.1037/0012-1649.37.2.207

Dimitrov, D. M., & Rumrill Jr., P. D. (2003). Pretest-posttest designs and measurement of change. *Work*, *20*(2), 159–165.

Dishion, T. J., Shaw, D., Connell, A., Gardner, F., Weaver, C., & Wilson, M. (2008). The family check-up With high-risk indigent families: Preventing problem behavior by increasing parents' positive behavior support in early childhood. *Child Development*, *79*(5), 1395–1414. https://doi.org/10.1111/j.1467-8624.2008.01195.x

Dore, M. M., Nelson-Zlupko, L., & Kaufmann, E. (1999). "Friends in Need": Designing and implementing a psychoeducational group for school children from drug-involved families. *Social Work*, *44*(2), 179–190. https://doi.org/10.1093/sw/44.2.179

Duchesne, S., Larose, S., Vitaro, F., & Tremblay, R. E. (2010). Trajectories of anxiety in a population sample of children: Clarifying the role of children's behavioral characteristics and maternal parenting. *Development and Psychopathology*, *22*(2), 361–373. https://doi.org/10.1017/S0954579410000118

Duncan, T. E., Duncan, S. C., Strycker, L. A., Li, F., & Alpert, A. (1999). *An introduction to latent variable growth curve modeling*. Mahweh, New Jersey: Lawrence Erlbaum Associates.

Dunn, M. G., Tarter, R. E., Mezzich, A. C., Vanyukov, M., Kirisci, L., & Kirillova, G. (2002). Origins and consequences of child neglect in substance abuse families. *Clinical Psychology Review*, *22*(7), 1063–1090. https://doi.org/10.1016/S0272-7358(02)00132-0

Eiden, R. D., Edwards, E. P., & Leonard, K. E. (2007). A conceptual model for the development of externalizing behavior problems among Kindergarten children of alcoholic families: Role of parenting and children's self-regulation. *Developmental Psychology*, *43*(5), 1187–1201. https://doi.org/10.1037/0012-1649.43.5.1187

Ellickson, P. L., Martino, S. C., & Collins, R. L. (2004). Marijuana use from adolescence to young adulthood: Multiple developmental trajectories and their associated outcomes. *Health Psychology*, *23*(3), 299–307. https://doi.org/10.1037/0278-6133.23.3.299

Enders, C. K. (2001). A primer on maximum likelihood algorithms available for use with missing data. *Structural Equation Modeling: A Multidisciplinary Journal*, *8*(1), 128–141. https://doi.org/10.1207/S15328007SEM0801_7

Enders, C. K. (2011). Missing not at random models for latent growth curve analyses. *Psychological Methods*, *16*(1), 1. https://doi.org/10.1037/a0022640

Enders, C. K., & Bandalos, D. L. (2001). The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Structural Equation Modeling: A Multidisciplinary Journal*, *8*(3), 430–457. https://doi.org/10.1207/S15328007SEM0803_5

Fanti, K. A., & Henrich, C. C. (20100906). Trajectories of pure and co-occurring internalizing and externalizing problems from age 2 to age 12: Findings from the National Institute of Child Health and Human Development Study of Early Child Care. *Developmental Psychology*, *46*(5), 1159. https://doi.org/10.1037/a0020659

Feingold, A. (2009). Effect sizes for growth-modeling analysis for controlled clinical trials in the same metric as for classical analysis. *Psychological Methods*, *14*(1), 43–53. https://doi.org/doi:10.1037/a0014699

Feldman, B. J., Masyn, K. E., & Conger, R. D. (2009). New approaches to studying problem behaviors: A comparison of methods for modeling longitudinal, categorical adolescent drinking data. *Developmental Psychology*, *45*(3), 652–676. https://doi.org/10.1037/a0014851

Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., … Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) study. *American Journal of Preventive Medicine*, *14*(4), 245–258. https://doi.org/10.1016/S0749-3797(98)00017-8

Finan, L. J., Schulz, J., Gordon, M. S., & Ohannessian, C. M. (2015). Parental problem drinking and adolescent externalizing behaviors: The mediating role of family functioning. *Journal of Adolescence*, *43*, 100–110. https://doi.org/10.1016/j.adolescence.2015.05.001

Flaherty, E. G., Thompson, R., Litrownik, A. J., Theodore, A., English, D. J., Black, M. M., … Dubowitz, H. (2006). Effect of early childhood adversity on child health. *Archives of Pediatrics & Adolescent Medicine*, *160*(12), 1232–1238. https://doi.org/10.1001/archpedi.160.12.1232

Gabel, S., & Shindledecker, R. (1992). Behavior problems in sons and daughters of substance abusing parents. *Child Psychiatry and Human Development*, *23*(2), 99–115. https://doi.org/10.1007/BF00709753

Goldschmidt, L., Day, N. L., & Richardson, G. A. (2000). Effects of prenatal marijuana exposure on child behavior problems at age 10. *Neurotoxicology and Teratology*, *22*(3), 325–336. https://doi.org/10.1016/S0892-0362(00)00066-0

Graber, J. A., & Brooks-Gunn, J. (1996). Transitions and turning points: Navigating the passage from childhood through adolescence. *Developmental Psychology*, *32*(4), 768. https://doi.org/10.1037/0012-1649.32.4.768

Gresham, F. M., & Kern, L. (2004). Internalizing behavior problems in children and adolescents. In R. B. Rutherford, M. M. Quinn, & S. R. Mathur (Eds.), *Handbook of research in emotional and behavioral disorders* (pp. 262–281). New York, NY, US: Guilford Press.

Heron, J., Hickman, M., Macleod, J., & Munafò, M. R. (2011). Characterizing patterns of smoking initiation in adolescence: Comparison of methods for dealing with missing data. *Nicotine & Tobacco Research*, *13*(12), 1266–1275. https://doi.org/10.1093/ntr/ntr161

Hesselbrock, M. N., Meyer, R. E., & Keener, J. J. (1985). Psychopathology in hospitalized alcoholics. *Archives of General Psychiatry*, *42*(11), 1050–1055. https://doi.org/10.1001/archpsyc.1985.01790340028004

Holden, G. W. (2010). Childrearing and developmental trajectories: Positive pathways, off-ramps, and dynamic processes. *Child Development Perspectives*, *4*(3), 197–204. https://doi.org/10.1111/j.1750-8606.2010.00148.x

Hser, Y.-I., Lanza, H. I., Li, L., Kahn, E., Evans, E., & Schulte, M. (2015). Maternal mental health and children's internalizing and externalizing behaviors: Beyond maternal substance use disorders. *Journal of Child and Family Studies*, *24*(3), 638–648. https://doi.org/10.1007/s10826-013-9874-3

Huang, D., Brecht, M.-L., Hara, M., & Hser, Y.-I. (2010). Influences of a covariate on growth mixture modeling. *Journal of Drug Issues*, *40*(1), 173–194. https://doi.org/10.1177/002204261004000110

Johnson, J. L., & Leff, M. (1999). Children of substance abusers: Overview of research findings. *Pediatrics*, *103*(5 Pt 2), 1085–1099. Retrieved from http://pediatrics.aappublications.org/content/103/Supplement_2/1085.long

Jones, D. E., Greenberg, M., & Crowley, M. (2015). Early social-emotional functioning and public health: The relationship between Kindergarten social competence and future wellness. *American Journal of Public Health*, *105*(11), 2283–2290. https://doi.org/10.2105/AJPH.2015.302630

Jung, T., & Wickrama, K. a. S. (2008). An introduction to latent class growth analysis and growth mixture modeling. *Social and Personality Psychology Compass*, *2*(1), 302–317. https://doi.org/10.1111/j.1751-9004.2007.00054.x

Kaplow, J. B., Curran, P. J., & Dodge, K. A. (2002). Child, parent, and peer predictors of early-onset substance use: A multisite longitudinal study. *Journal of Abnormal Child Psychology*, *30*(3), 199–216. https://doi.org/10.1023/A:1015183927979

Kelley, M. L., & Fals-Stewart, W. (2004). Psychiatric disorders of children living with drug-abusing, alcohol-abusing, and non–substance-abusing fathers. *Journal of the American Academy of Child & Adolescent Psychiatry*, *43*(5), 621–628. https://doi.org/10.1097/00004583-200405000-00016

Kim, S.-Y. (2014). Determining the number of latent classes in single- and multiphase growth mixture models. *Structural Equation Modeling: A Multidisciplinary Journal*, *21*(2), 263–279. https://doi.org/10.1080/10705511.2014.882690

Kuckertz, J. M., Mitchell, C., & Wiggins, J. L. (2017). Parenting mediates the impact of maternal depression on child internalizing symptoms. *Depression and Anxiety*, *35*(1), 89–97. https://doi.org/10.1002/da.22688

Latendresse, S. J., Bates, J. E., Goodnight, J. A., Lansford, J. E., Budde, J. P., Goate, A., … Dick, D. M. (2011). Differential susceptibility to adolescent externalizing trajectories: examining the interplay between CHRM2 and peer group antisocial behavior. *Child Development*, *82*(6), 1797–1814. https://doi.org/10.1111/j.1467-8624.2011.01640.x

Laursen, B., & Hoff, E. (2006). Person-centered and variable-centered approaches to longitudinal data. *Merrill-Palmer Quarterly*, *52*(3), 377–389. Retrieved from https://www-jstor-org.udel.idm.oclc.org/stable/23096200

Lerner, R. M. (1984). *On the nature of human plasticity*. New York, NY: Cambridge University Press.

Lerner, R. M. (2002). *Concepts and theories of human development*. Mahwah, NJ: Lawrence Erlbaum Associates.

Lerner, R. M. (2006). Developmental science, developmental systems, and contemporary theories of human development. In R. M. Lerner (Ed.), *Handbook of child psychology* (6th ed., Vol. 1, pp. 1–36). Hoboken, NJ, US: Wiley.

Lerner, R. M., Hershberg, R. M., Hilliard, L. J., & Johnson, S. K. (2015). Concepts and theories of human development. In M. H. Bornstein & M. E. Lamb, *Developmental Science* (7th ed., pp. 3–42). New York: Psychology Press.

Lerner, R. M., Leonard, K., Fay, K., & Issac, S. S. (2011). Continuity and discontinuity in development across the life span: A developmental systems perspective. In K. L. Fingerman, C. A. Berg, J. Smith, & T. C. Antonucci (Eds.), *Handbook of life-span development* (pp. 141–160). New York, NY: Springer.

Li, C., Pentz, M. A., & Chou, C.-P. (2002). Parental substance use as a modifier of adolescent substance use risk. *Addiction*, *97*(12), 1537–1550. https://doi.org/10.1046/j.1360-0443.2002.00238.x

Lipari, R. N., Park-Lee, E., & Van Horn, S. L. (2016). *America's need for and receipt of substance use treatment in 2015* (Short Report). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. Retrieved from https://www.samhsa.gov/data/sites/default/files/report_2790/ShortReport-2790.html

Lipari, R. N., & Van Horn, S. L. (2017). *Children living with parents who have a substance use disorder* (The CBHSQ Report). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. Retrieved from https://www.samhsa.gov/data/sites/default/files/report_3223/ShortReport-3223.pdf

Liu, J. (2004). Childhood externalizing behavior: Theory and implications. *Journal of Child and Adolescent Psychiatric Nursing*, *17*(3), 93–103. https://doi.org/10.1111/j.1744-6171.2004.tb00003.x

Lo, Y., Mendell, N. R., & Rubin, D. B. (2001). Testing the number of components in a normal mixture. *Biometrika*, *88*(3), 767–778. https://doi.org/10.1093/biomet/88.3.767

Marsh, H. W., Lüdtke, O., Trautwein, U., & Morin, A. J. S. (2009). Classical latent profile analysis of academic self-concept dimensions: Synergy of person- and variable-centered approaches to theoretical models of self-concept. *Structural*

Equation Modeling: A Multidisciplinary Journal, *16*(2), 191–225. https://doi.org/10.1080/10705510902751010

McLachlan, G., & Peel, D. (2000). Multivariate normal mixtures. In *Finite Mixture Models* (pp. 81–116). New York, NY: Wiley.

Mesman, J., & Koot, H. M. (2001). Early preschool predictors of preadolescent internalizing and externalizing DSM-IV diagnoses. *Journal of the American Academy of Child & Adolescent Psychiatry*, *40*(9), 1029–1036. https://doi.org/10.1097/00004583-200109000-00011

Moffitt, T. E. (1993). Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review*, *100*(4), 674–701. https://doi.org/10.1037/0033-295X.100.4.674

Morgan, G. B. (2015). Mixed mode latent class analysis: An examination of fit index performance for classification. *Structural Equation Modeling: A Multidisciplinary Journal*, *22*(1), 76–86. https://doi.org/10.1080/10705511.2014.935751

Muthén, B. (2001). Second-generation structural equation modeling with a combination of categorical and continuous latent variables: New opportunities for latent class–latent growth modeling. In L. M. Collins & G. Sayer (Eds.), *Decade of behavior. New methods for the analysis of change* (pp. 291–322). Washington, D.C.: American Psychological Association. Retrieved from http://dx.doi.org.udel.idm.oclc.org/10.1037/10409-010

Muthén, B. (2004). Latent variable analysis. In D. Kaplan (Ed.), *The SAGE handbook of quantitative methodology for the social sciences* (Vol. 345, p. 368). Thousand Oaks, CA: SAGE Publications. Retrieved from http://dx.doi.org/10.4135/9781412986311.n19

Muthén, B., & Muthén, L. K. (2000). Integrating person-centered and variable-centered analyses: Growth mixture modeling with latent trajectory classes. *Alcoholism: Clinical and Experimental Research*, *24*(6), 882–891. https://doi.org/10.1111/j.1530-0277.2000.tb02070.x

Muthén, B. O. (2001). Latent variable mixture modeling. In G. A. Marcoulides & R. E. Schumacker (Eds.), *New developments and techniques in structural equation modeling* (1st ed., pp. 21–54). New York, NY: Psychology Press. Retrieved from https://doi-org.udel.idm.oclc.org/10.4324/9781410601858

Muthén, B., & Shedden, K. (1999). Finite Mixture Modeling with Mixture Outcomes Using the EM Algorithm. *Biometrics*, *55*(2), 463–469. https://doi.org/10.1111/j.0006-341X.1999.00463.x

Nagin, D. S. (19990901). Analyzing developmental trajectories: A semiparametric, group-based approach. *Psychological Methods*, *4*(2), 139. https://doi.org/10.1037/1082-989X.4.2.139

National Center for Health Statistics. (2017). *Health, United States, 2016*. Hyattsville, MD. Retrieved from https://www.cdc.gov/nchs/data/hus/hus16.pdf

National Center on Addiction and Substance Abuse. (1999). *No safe haven: Children of substance-abusing parents*. New York, NY: The National Center on

Addiction and Substance Abuse at Columbia University. Retrieved from https://ncsacw.samhsa.gov/files/508/NoSafeHaven.htm

National Institute on Alcohol Abuse and Alcoholism (NIAAA). (2017). Drinking levels defined. Retrieved March 21, 2018, from https://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/moderate-binge-drinking

NIDA. (2015). Substance Use in Women. Retrieved December 11, 2018, from https://www.drugabuse.gov/publications/drugfacts/substance-use-in-women

Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling*, *14*(4), 535–569. https://doi.org/10.1080/10705510701575396

Overton, W. F. (2013). Relationism and relational developmental systems: A paradigm for developmental science in the post-Cartesian era. In R.M. Lerner & J. B. Benson (Eds.), *Advances in child development and behavior* (Vol. 44, pp. 21–64). Elsevier.

Pandina, R. J., Labouvie, E. W., & White, H. R. (1984). Potential contributions of the life span developmental approach to the study of adolescent alcohol and drug use: The Rutgers Health and Human Development Project, a working model. *Journal of Drug Issues*, *14*(2), 253–268. https://doi.org/10.1177/002204268401400206

Parke, R. D., Ornstein, P. A., Rieser, J. J., & Zahn-Waxler, C. (Eds.). (1994). *A century of developmental psychology*. Washington, DC, US: American Psychological Association. https://doi.org/10.1037/10155-000

Peleg-Oren, N., & Teichman, M. (2006). Young children of parents with substance use disorders (SUD): A review of the literature and implications for social work practice. *Journal of Social Work Practice in the Addictions*, *6*(1–2), 49–61. https://doi.org/10.1300/J160v06n01_03

Peugh, J. L., & Enders, C. K. (2004). Missing data in educational research: A review of reporting practices and suggestions for improvement. *Review of Educational Research*, *74*(4), 525–556. https://doi.org/10.3102/00346543074004525

Pivnick, A., & Villegas, N. (2000). Resilience and risk: Childhood and uncertainty in the AIDS epidemic. *Culture, Medicine and Psychiatry*, *24*(1), 99–134. https://doi.org/10.1023/A:1005574212572

Puma, M. J., Olsen, R. B., Bell, S. H., & Price, C. (2009). *What to do when data are missing in group randomized controlled trials.* (NCEE No. 2009–0049). National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences. Retrieved from https://files.eric.ed.gov/fulltext/ED511781.pdf

Puttler, L. I., Zucker, R. A., Fitzgerald, H. E., & Bingham, C. R. (1998). Behavioral outcomes among children of alcoholics during the early and middle childhood years: Familial subtype variations. *Alcoholism: Clinical and Experimental*

Research, *22*(9), 1962–1972. https://doi.org/10.1111/j.1530-0277.1998.tb05904.x

Reichman, N. E., Teitler, J. O., Garfinkel, I., & McLanahan, S. S. (2001). Fragile Families: Sample and design. *Children and Youth Services Review*, *23*(4), 303–326. https://doi.org/10.1016/S0190-7409(01)00141-4

Richardson, H. A., Simmering, M. J., & Sturman, M. C. (2009). A tale of three perspectives: Examining post hoc statistical techniques for detection and correction of common method variance. *Organizational Research Methods*, *12*(4), 762–800. https://doi.org/10.1177/1094428109332834

Rossow, I., Felix, L., Keating, P., & McCambridge, J. (2016). Parental drinking and adverse outcomes in children: A scoping review of cohort studies. *Drug and Alcohol Review*, *35*(4), 397–405. https://doi.org/10.1111/dar.12319

Roza, S. J., Hofstra, M. B., van der Ende, J., & Verhulst, F. C. (2003). Stable prediction of mood and anxiety disorders based on behavioral and emotional problems in childhood: A 14-year follow-up during childhood, adolescence, and young adulthood. *American Journal of Psychiatry*, *160*(12), 2116–2121. https://doi.org/10.1176/appi.ajp.160.12.2116

Schulenberg, J. E., Merline, A. C., Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Laetz, V. B. (2005). Trajectories of marijuana use during the transition to adulthood: The big picture based on national panel data. *Journal of Drug Issues*, *35*(2), 255–280. https://doi.org/10.1177/002204260503500203

Schwarz, G. (1978). Estimating the dimension of a model. *Annals of Statistics*, *6*(2), 461–464.

Sclove, S. L. (1987). Application of model-selection criteria to some problems in multivariate analysis. *Psychometrika*, *52*(3), 333–343. https://doi.org/10.1007/BF02294360

Silver, R. B., Measelle, J. R., Armstrong, J. M., & Essex, M. J. (2010). The impact of parents, child care providers, teachers, and peers on early externalizing trajectories. *Journal of School Psychology*, *48*(6), 555–583. https://doi.org/10.1016/j.jsp.2010.08.003

Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York, NY: Oxford University Press.

Sokol, R. J., Delaney-Black, V., & Nordstrom, B. (2003). Fetal alcohol spectrum disorder. *JAMA*, *290*(22), 2996–2999. https://doi.org/10.1001/jama.290.22.2996

Staton-Tindall, M., Sprang, G., Clark, J., Walker, R., & Craig, C. D. (2013). Caregiver substance use and child outcomes: A systematic review. *Journal of Social Work Practice in the Addictions*, *13*(1), 6–31. https://doi.org/10.1080/1533256X.2013.752272

Substance Abuse and Mental Health Services Administration [SAMHSA]. (2016). Binge Drinking: Terminology and Patterns of Use | SAMHSA. Retrieved May 18, 2018, from https://www.samhsa.gov/capt/tools-learning-resources/binge-drinking-terminology-patterns

Suchman, N. E., & Luthar, S. S. (2000). Maternal addiction, child maladjustment and socio-demographic risks: Implications for parenting behaviors. *Addiction*, *95*(9), 1417–1428. https://doi.org/10.1046/j.1360-0443.2000.959141711.x

Tucker, J. S., Ellickson, P. L., Orlando, M., Martino, S. C., & Klein, D. J. (2005). Substance use trajectories from early adolescence to emerging adulthood: A comparison of smoking, binge drinking, and marijuana use. *Journal of Drug Issues*, *35*(2), 307–332. https://doi.org/10.1177/002204260503500205

Tucker, J. S., Orlando, M., & Ellickson, P. L. (2003). Patterns and correlates of binge drinking trajectories from early adolescence to young adulthood. *Health Psychology*, *22*(1), 79–87. https://doi.org/10.1037/0278-6133.22.1.79

U.S. Department of Health and Human Services, and Centers for Disease Control and Prevention. (2013). Mental health surveillance among children—United States, 2005–2011. *MMWR Morb. Mortal. Wkly. Rep.*, (62), 1–35. Retrieved from https://www.cdc.gov/Mmwr/preview/mmwrhtml/su6202a1.htm

U.S. Department of Health and Human Services (HHS), Office of the Surgeon General. (2016). *Facing addiction in America: The surgeon general's report on alcohol, drugs, and health*. Washington, D.C.: HHS. Retrieved from https://addiction.surgeongeneral.gov/sites/default/files/surgeon-generals-report.pdf

Vuong, Q. H. (1989). Likelihood ratio tests for model selection and non-nested hypotheses. *Econometrica*, *57*(2), 307–333. https://doi.org/10.2307/1912557

Wakeman, S. E., Pham-Kanter, G., & Donelan, K. (2016). Attitudes, practices, and preparedness to care for patients with substance use disorder: Results from a survey of general internists. *Substance Abuse*, *37*(4), 635–641. https://doi.org/10.1080/08897077.2016.1187240

Whitaker, R. C., Orzol, S. M., & Kahn, R. S. (2006). Maternal mental health, substance use, and domestic violence in the year after delivery and subsequent behavior problems in children at age 3 years. *Archives of General Psychiatry*, *63*(5), 551–560. https://doi.org/10.1001/archpsyc.63.5.551

Wiggins, J. L., Mitchell, C., Hyde, L. W., & Monk, C. S. (2015). Identifying early pathways of risk and resilience: The co-development of internalizing and externalizing symptoms and the role of harsh parenting. *Development and Psychopathology*, *27*(4 Pt 1), 1295–1312. https://doi.org/10.1017/S0954579414001412

Wilens, T. E., Biederman, J., Bredin, E., Hahesy, A. L., Abrantes, A., Neft, D., … Spencer, T. J. (2002). A family study of the high-risk children of opioid- and alcohol-dependent parents. *The American Journal on Addictions*, *11*(1), 41–51. https://doi.org/10.1080/10550490252801620

Wright, D. B. (2006). Comparing groups in a before–after design: When t test and ANCOVA produce different results. *British Journal of Educational Psychology*, *76*(3), 663–675. https://doi.org/10.1348/000709905X52210

Yang, C.-C. (2006). Evaluating latent class analysis models in qualitative phenotype identification. *Computational Statistics & Data Analysis*, *50*(4), 1090–1104. https://doi.org/10.1016/j.csda.2004.11.004

Appendix

FRAGILE FAMILIES RAW DATA

Externalizing Behavior Items (Child ages 5, 9, and 15)

1. He/she argues a lot.

    - Very true or often true, ...3
    - Somewhat true or sometimes true, ...2
    - Not true, ...1
    - Refuse, ...-1
    - Don't know, ...-2
    - Missing .....-3
    - Multiple ans .....-4
    - Not asked .....-5
    - Skip .....-6
    - N/A .....-7
    - Out of range .....-8
    - Not in wave .....-9

2. He/she is cruel, bullies, or shows meanness to others.

    - Very true or often true, ...3
    - Somewhat true or sometimes true, ...2
    - Not true, ...1
    - Refuse, ...-1
    - Don't know, ...-2
    - Missing .....-3

- Multiple ans .....-4
- Not asked .....-5
- Skip .....-6
- N/A .....-7
- Out of range .....-8
- Not in wave.....-9

3. He/she destroys things belonging to family or others.
    - Very true or often true, ...3
    - Somewhat true or sometimes true, ...2
    - Not true, ...1
    - Refuse, ...-1
    - Don't know, ...-2
    - Missing .....-3
    - Multiple ans .....-4
    - Not asked .....-5
    - Skip .....-6
    - N/A .....-7
    - Out of range .....-8
    - Not in wave.....-9

4. He/she is disobedient at home.
    - Very true or often true, ...3
    - Somewhat true or sometimes true, ...2

- Not true, ... 1
- Refuse, ... -1
- Don’t know, ... -2
- Missing ..... -3
- Multiple ans ..... -4
- Not asked ..... -5
- Skip ..... -6
- N/A ..... -7
- Out of range ..... -8
- Not in wave ..... -9

5. He/she is disobedient at school.

- Very true or often true, ... 3
- Somewhat true or sometimes true, ... 2
- Not true, ... 1
- Refuse, ... -1
- Don’t know, ... -2
- Missing ..... -3
- Multiple ans ..... -4
- Not asked ..... -5
- Skip ..... -6
- N/A ..... -7
- Out of range ..... -8
- Not in wave ..... -9

6. He/she gets in many fights.

- Very true or often true, ...3
- Somewhat true or sometimes true, ...2
- Not true, ...1
- Refuse, ...-1
- Don't know, ...-2
- Missing .....-3
- Multiple ans .....-4
- Not asked .....-5
- Skip .....-6
- N/A .....-7
- Out of range .....-8
- Not in wave .....-9

7. He/she is stubborn, sullen, or irritable.

- Very true or often true, ...3
- Somewhat true or sometimes true, ...2
- Not true, ...1
- Refuse, ...-1
- Don't know, ...-2
- Missing .....-3
- Multiple ans .....-4
- Not asked .....-5
- Skip .....-6

- N/A .....-7
- Out of range .....-8
- Not in wave.....-9

8. He/she has temper tantrums or a hot temper.
    - Very true or often true, ...3
    - Somewhat true or sometimes true, ...2
    - Not true, ...1
    - Refuse, ...-1
    - Don't know, ...-2
    - Missing .....-3
    - Multiple ans .....-4
    - Not asked .....-5
    - Skip.....-6
    - N/A .....-7
    - Out of range .....-8
    - Not in wave.....-9

9. He/she threatens people.
    - Very true or often true, ...3
    - Somewhat true or sometimes true, ...2
    - Not true, ...1
    - Refuse, ...-1
    - Don't know, ...-2

- Missing .....-3
- Multiple ans .....-4
- Not asked .....-5
- Skip .....-6
- N/A .....-7
- Out of range .....-8
- Not in wave.....-9

10. He/she is unusually loud.

- Very true or often true, ...3
- Somewhat true or sometimes true, ...2
- Not true, ...1
- Refuse, ...-1
- Don't know, ...-2
- Missing .....-3
- Multiple ans .....-4
- Not asked .....-5
- Skip .....-6
- N/A .....-7
- Out of range .....-8
- Not in wave.....-9

11. He/she doesn't seem to feel guilty after misbehaving.

- Very true or often true, ...3

- Somewhat true or sometimes true, ...2
- Not true, ...1
- Refuse, ...-1
- Don’t know, ...-2
- Missing .....-3
- Multiple ans .....-4
- Not asked .....-5
- Skip .....-6
- N/A .....-7
- Out of range .....-8
- Not in wave.....-9

12. He/she lies or cheats.

- Very true or often true, ...3
- Somewhat true or sometimes true, ...2
- Not true, ...1
- Refuse, ...-1
- Don’t know, ...-2
- Missing .....-3
- Multiple ans .....-4
- Not asked .....-5
- Skip .....-6
- N/A .....-7
- Out of range .....-8

- Not in wave.....-9

13. He/she runs away from home.

- Very true or often true, ...3
- Somewhat true or sometimes true, ...2
- Not true, ...1
- Refuse, ...-1
- Don’t know, ...-2
- Missing .....-3
- Multiple ans .....-4
- Not asked .....-5
- Skip .....-6
- N/A .....-7
- Out of range .....-8
- Not in wave.....-9

14. He/she sets fires.

- Very true or often true, ...3
- Somewhat true or sometimes true, ...2
- Not true, ...1
- Refuse, ...-1
- Don’t know, ...-2
- Missing .....-3
- Multiple ans .....-4

- Not asked .....-5
- Skip .....-6
- N/A .....-7
- Out of range .....-8
- Not in wave.....-9

15. He/she steals at home.

- Very true or often true, ...3
- Somewhat true or sometimes true, ...2
- Not true, ...1
- Refuse, ...-1
- Don't know, ...-2
- Missing .....-3
- Multiple ans .....-4
- Not asked .....-5
- Skip .....-6
- N/A .....-7
- Out of range .....-8
- Not in wave.....-9

16. He/she steals outside the home.

- Very true or often true, ...3
- Somewhat true or sometimes true, ...2
- Not true, ...1

- Refuse, ...-1
- Don’t know, ...-2
- Missing .....-3
- Multiple ans .....-4
- Not asked .....-5
- Skip .....-6
- N/A .....-7
- Out of range .....-8
- Not in wave.....-9

17. He/she swears or uses obscene language.

- Very true or often true, ...3
- Somewhat true or sometimes true, ...2
- Not true, ...1
- Refuse, ...-1
- Don’t know, ...-2
- Missing .....-3
- Multiple ans .....-4
- Not asked .....-5
- Skip .....-6
- N/A .....-7
- Out of range .....-8
- Not in wave.....-9

18. He/she vandalizes.

- Very true or often true, ...3
- Somewhat true or sometimes true, ...2
- Not true, ...1
- Refuse, ...-1
- Don't know, ...-2
- Missing .....-3
- Multiple ans .....-4
- Not asked .....-5
- Skip .....-6
- N/A .....-7
- Out of range .....-8
- Not in wave .....-9

Internalizing Behavior Items (Child ages 5, 9, and 15)

1. He/she complains of loneliness.

- Very true or often true, ...3
- Somewhat true or sometimes true, ...2
- Not true, ...1
- Refuse, ...-1
- Don't know, ...-2
- Missing .....-3
- Multiple ans .....-4
- Not asked .....-5

- Skip.....-6
- N/A .....-7
- Out of range.....-8
- Not in wave.....-9

2. He/she feels worthless or inferior.

    - Very true or often true, ...3
    - Somewhat true or sometimes true, ...2
    - Not true, ...1
    - Refuse, ...-1
    - Don't know, ...-2
    - Missing .....-3
    - Multiple ans .....-4
    - Not asked .....-5
    - Skip.....-6
    - N/A .....-7
    - Out of range .....-8
    - Not in wave.....-9

3. He/she is nervous, high strung, or tense.

    - Very true or often true, ...3
    - Somewhat true or sometimes true, ...2
    - Not true, ...1
    - Refuse, ...-1

- Don’t know, ...-2
- Missing .....-3
- Multiple ans .....-4
- Not asked .....-5
- Skip .....-6
- N/A .....-7
- Out of range .....-8
- Not in wave.....-9

4. He/she is too fearful or anxious.
    - Very true or often true, ...3
    - Somewhat true or sometimes true, ...2
    - Not true, ...1
    - Refuse, ...-1
    - Don’t know, ...-2
    - Missing .....-3
    - Multiple ans .....-4
    - Not asked .....-5
    - Skip .....-6
    - N/A .....-7
    - Out of range .....-8
    - Not in wave.....-9

5. He/she feels too guilty.

- Very true or often true, ...3
- Somewhat true or sometimes true, ...2
- Not true, ...1
- Refuse, ...-1
- Don’t know, ...-2
- Missing .....-3
- Multiple ans .....-4
- Not asked .....-5
- Skip .....-6
- N/A .....-7
- Out of range .....-8
- Not in wave .....-9

6. He/she worries.

- Very true or often true, ...3
- Somewhat true or sometimes true, ...2
- Not true, ...1
- Refuse, ...-1
- Don’t know, ...-2
- Missing .....-3
- Multiple ans .....-4
- Not asked .....-5
- Skip .....-6
- N/A .....-7

- Out of range .....-8
- Not in wave.....-9

Maternal Binge-drinking (Child ages 5 and 9)

1. The next questions are about how frequently you drink alcoholic beverages. By a "drink" we mean either a bottle of beer, a wine cooler, a glass of wine, a shot of liquor, or a mixed drink. With these definitions in mind, what is the largest number of drinks you had in any single day during the past twelve months—none, between one to three, four to ten, eleven to twenty, or more than twenty drinks in a single day?
   - None, ... 0
   - Between one and three,.....1
   - Four to ten,.....2
   - Eleven to twenty, or.....3
   - More than twenty drinks in a single day, ...4
   - REFUSED .....-1
   - DON'T KNOW.....2

2. In the past twelve months, how often did you have four or more drinks in one day? Was it…
   - Every day or almost every day, ...1
   - A few times a week, ...2
   - A few times a month,.....3

- About once a month, or 4
- Less than once a month?.....5
- REFUSED .....-1
- DON'T KNOW .....-2

Maternal Marijuana Use (Child ages 5 and 9)

1. The next questions are about your use of drugs on your own. By "on your own," we mean either without a doctor's prescription, in larger amounts than prescribed, or for a longer period than prescribed. With this definition in mind, did you use any of these drugs on your own during the past twelve months? During the past twelve months did you use Marijuana or hashish?
    - YES.....1
    - NO 2