8-2022

Prevalence and Predictors of Polypharmacy in Adolescents who have Engaged in Sexually Abusive Behaviors

Rebecca Gilley
East Tennessee State University

Prevalence and Predictors of Polypharmacy in Adolescents who have Engaged in Sexually Abusive Behaviors

---

A dissertation

presented to

the faculty of the Department of Psychology

East Tennessee State University

In partial fulfillment

of the requirements for candidacy to

Doctor of Philosophy in Clinical Psychology

---

by

Rebecca Gilley

August 2021

Jill Stinson, Ph.D., Chair

Alyson Chroust, Ph.D.

Meredith Ginley, Ph.D.

Rachel Miller-Slough, Ph.D.

Keywords: polypharmacy, psychotropic medication, youth

ABSTRACT

Prevalence and Predictors of Polypharmacy in

Adolescents who have Engaged in Sexually Abusive Behaviors

by

Rebecca Gilley

Polypharmacy, or the concurrent use of multiple medications, is associated with detrimental outcomes for patients and has gathered increasing attention within the scientific clinical literature. Pediatric populations warrant special consideration for the practice of polypharmacy, as medication effects are more pronounced in youth and adverse effects may have a lasting impact on development. This dissertation study examined psychotropic prescribing practices in a sample of adolescents who have engaged in sexually abusive behaviors, a subset of justice-involved youth who are at risk for polypharmacy. General prescribing trends were examined, and a principle components analysis involving variables associated with risk of polypharmacy was conducted. Results indicated that polypharmacy was common, with many youth being prescribed medications at a young age. Use of risky medications such as antipsychotics was also prevalent, even for individuals without psychosis. Analyses suggested that behavioral issues, trauma and residential instability, and complex psychological concerns were significantly associated with polypharmacy outcomes. Clinical implications of findings are discussed.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1. Introduction

Polypharmacy, or the use of multiple medications to treat complex physical and psychological conditions, is a critical topic across varied aspects of healthcare research. The practice of polypharmacy has become increasingly common, and its potentially negative consequences continue to be important considerations for pharmacological care. Despite the growing literature base investigating polypharmacy, the definition of this practice varies widely. As indicated by the prefix *poly*, researchers generally agree that the word indicates the use of multiple medications to treat someone at a given time. However, some studies utilize a threshold of two or more medications (e.g., Kukreja et al., 2013), while others use thresholds of up to five or ten concurrent medications (e.g., Gnjidic et al., 2017; Guthrie et al., 2015). Others have also distinguished between polypharmacy involving various drug types, such as concurrent use of a blood pressure medication and antidepressant, versus polypharmacy specific to a given target problem, such as concurrent use of two antidepressants to treat depression.

As other researchers have noted, the inconsistency in definitions and inclusion criteria for polypharmacy is a major limitation within this research base (Guthrie et al., 2015; Rhee & Rosenheck, 2019). Comparisons across studies that utilize different definitions may be inappropriate, and it becomes unclear as to which types of polypharmacy (or perhaps all of them) are most likely to yield detrimental results. Differentiating between within-class and between-class polypharmacy is highly beneficial (Rhee & Rosenheck, 2019). Within-class comedication is more likely to be previously studied and supported as an evidence-based practice, whereas between-class comedication can produce drug-drug interactions given that the medications work in different ways. Additionally, between-class polypharmacy may be common in psychiatric

populations, as these patients evidence high rates of comorbidity, requiring multiple medication classes for differential presenting concerns (Mojtabai & Olfson, 2008).

Despite these variations in defining polypharmacy itself, the practice of providing concurrent prescription of multiple medications has increased over time for both adult and youth populations (e.g., Bourgeois et al., 2006; Haider et al., 2007). Polypharmacy practices for pediatric populations have unique considerations, such as lasting side effects, differences in developmental stages, and off-label prescribing. Other specific subpopulations evidence further risk of polypharmacy, such as individuals with complex health needs (Brenner et al., 2014; Duffy et al., 2005), those who experience trauma (Anda et al., 2007; Koskenvuo & Koskenvuo, 2014), and justice-involved populations (Griffiths et al., 2012; Lyons et al., 2013). Some children may fall into multiple at-risk categories. Youth who have engaged in sexually abusive behaviors represent a unique group that evidences risk for polypharmacy in multiple ways, though there is currently no research specific to polypharmacy practices in this population. More information is needed to better understand prescribing practices for these youth, as they may be particularly vulnerable to possible detrimental outcomes associated with polypharmacy. I will first review information on the general practice of polypharmacy, followed by literature specific to subpopulations related to this area of interest.

Prevalence and Contributing Factors

Prescribing trends indicate the rise of polypharmacy prescription practices, with longitudinal studies noting increases in prevalence over time (Bourgeois et al., 2006; Guthrie et al., 2015; Haider et al., 2007). An estimated 31% of adult patients are prescribed two or more drugs, and 11-35.8% are prescribed five or more drugs (Gu et al., 2010; Qato et al., 2016). The proportion of adult patients taking five or more medications more than doubled between 1995

and 2005 (Bourgeois et al., 2006). Although these rates are noteworthy, it is important to specify that polypharmacy is not altogether negative. In many cases, polypharmacy may be clinically appropriate and extremely helpful for the patient. However, it is important for providers to weigh the risks of negative consequences in their decision-making.

The current study focuses on psychotropic polypharmacy, which pertains to the use of multiple prescribed medications to alter a patient's psychological state and functioning and to specifically treat forms of psychopathology. The rise of psychotropic polypharmacy has been associated with various root causes. For example, Ghaemi (2002) identified five associated contributing factors: 1) scientific advances illustrating medication efficacy; 2) economic impacts of pharmaceutical companies and corresponding market; 3) influences of medications and their efficacy on revisions to the diagnostic system for psychological disorders, resulting in many diagnoses that overlap in symptoms; 4) political influences from regulations by agencies like the U.S. Food and Drug Administration; and 5) U.S. cultural attitudes, in that Americans often prefer medication over behavioral therapies, stemming from their desire for more immediate relief from ailments. This latter factor is also evident from the push for medication over more long-term solutions like individual therapy, with an increasing number of psychiatrists specializing in pharmacotherapy and fewer offering psychosocial or behavioral therapy options (Mojtabai & Olfson, 2008).

Polypharmacy may also result from characteristics of the medications themselves. Some psychotropic medications have a delayed onset of action, during which other medications may be prescribed to provide some degree of symptom reduction (Möller et al., 2014; Preskorn & Lacey, 2007). Psychological disorders are also sometimes described as treatment resistant (e.g., depression), such that some medications produce a non-response (Millan, 2014; Möller et al.,

2014). This leads to a trial-and-error approach in which various medications may be added or removed at varying intervals. Sometimes medications are added solely for the purpose of treating the side effects of another medication, creating a cycle of continual prescription and corresponding polypharmacy (Kukreja et al., 2013; Möller et al., 2014).

The complexity of psychological disorders, which often involve multiple interacting and reciprocal neurobiological systems, is yet another factor that contributes to polypharmacy. This lack of simplicity complicates pharmacological treatment, as there are often not singular targets but rather multiple interacting systems that produce a cascading effect (Möller et al., 2014). Additionally, psychotropic medication efficacy research is influenced by irrational or unrealistic expectations of treatment outcomes (Ghaemi, 2002; Möller et al., 2014). That is, treatment success is often measured by elimination of symptoms or significant symptom reduction, rather than outcomes that acknowledge the chronicity of psychological distress (e.g., increased quality of life, longer periods of time between relapses/major episodes, improved functionality). For more severe and persistent psychological disorders, a goal of total elimination of symptoms may not be attainable. However, these unrealistic beliefs may lead to prescriptions being added to address various symptoms of a disorder, rather than helping the patient understand and cope with the chronicity of their condition and develop goals more consistent with expected outcomes.

Thus, while there are factors that may indicate that psychotropic polypharmacy is appropriate, there are also negative consequences that may be related to use of multiple medications at once. Prescribers should be aware of these in order to determine if additional medications would either benefit or instead adversely impact their patients.

Negative Outcomes associated with Polypharmacy

There are various negative outcomes associated with polypharmacy. First, multiple medications can quickly complicate a pharmacological regimen. Medications commonly have specifiers, for example: administer at morning or night, administer with or without food, cannot be administered at the same time as other medications, double the quantity if a dose is missed, take as needed versus regularly. Increasing the number of medications inherently increases the amount of information a patient must remember. Ample studies that have demonstrated that polypharmacy is associated with poor medication adherence (e.g., Inauen et al., 2017; Markotic et al., 2013; Viktil et al., 2007). Relatedly, when patients do experience positive outcomes following being medicated, the confounding effects of different drugs makes it more difficult for medical professionals to understand which drug is causing relief (Kukreja et al., 2013).

Second, polypharmacy increases risk for adverse drug reactions (ADRs), with increasing numbers of concurrent drugs producing a dose-response relationship with risk of ADRs (Bourgeois et al., 2010; Viktil et al., 2007). Common ADRs include gastrointestinal disturbance, fatigue, dizziness, and cardiovascular problems (Khalil & Huang, 2020). Although often acute, these side effects can sometimes lead patients to the emergency room, with ADRs accounting for 2-3% of all emergency department visits for unintentional injuries (Bourgeois et al., 2010; Budnitz et al., 2006). ADRs can also be potentially fatal. One meta-analysis estimated that 4.6% of deaths in the United States may be the result of an adverse drug event (ADE), of which ADRs are a subsample (Lazarou et al., 1998). The risk of ADRs may be one reason why polypharmacy has been linked to increased risk of mortality (e.g., Gómez et al., 2014; Mansur et al., 2008).

Third, multiple medications also increase the risk for drug-drug interactions (Guthrie et al., 2015; Haider et al., 2007; Qato et al., 2016). One drug may change the pharmacokinetics of

another drug, meaning there could be a change in the nature, magnitude, and/or duration of the drug's effect (Kukreja et al., 2013; Preskorn & Lacey, 2007). These drug interactions not only complicate the mechanisms of pharmacotherapy but can also lead to ADRs, which may then be more severe. Multiple drugs may have the same adverse effects or work on the same systems, compounding such problems. In extreme cases, this could even cause an unintentional overdose, especially if drugs are sedating or nervous system depressants. Drug-drug interactions and related pharmacokinetics can also lead to the cumulative toxicity of substances that are not harmful at low doses but can be lethal if accumulated within the body (Kukreja et al., 2013).

Psychotropic Medication ADRs

Psychotropic medications should be uniquely considered, as their ADRs can be significant and impact both physical and psychological systems. Common ADRs of such medications include changes in mental status, behavior, or mood (Olfson, 2015). Sedatives and anxiolytics may cause impaired cognitive functioning, reduced mobility, and falls. Stimulants are associated with cardiovascular ADRs, namely heart palpitations. Hypersensitivity and sensory disturbances are the most common ADRs for antidepressants, and patients also frequently experience sexual dysfunction (Olfson, 2015; Resnik, 2008).

Antipsychotics are one drug class for which ADRs can be particularly burdensome. Psychological side effects include impaired concentration, confusion, attention deficit, and memory impairment (Lieberman, 2004; Möller et al., 2014). Physical side effects include dry mouth, constipation, urinary retention, bowel obstruction, dilated pupils, blurred vision, increased heart rate, and decreased sweating. Weight gain is also extremely common. Antipsychotics often induce extrapyramidal side effects (EPS), which encompass tardive dyskinesia, dystonia, akathisia, and parkinsonism. EPS can be debilitating for the patient, as they

impact everyday motor tasks and coordination, communication, and activities of daily living (D'Souza & Hooten, 2020). First-generation antipsychotics are linked to a higher risk of EPS in comparison to their second-generation counterparts, though rates for both range from 4-67% (Divac et al., 2014; Janno et al., 2004). In one study, polypharmacy increased the likelihood of anti-EPS treatment two-fold (Carnahan et al., 2006), indicating that multiple medications exacerbate the risk of such ADRs.

These considerations are important given that psychiatric polypharmacy is common; an estimated 60% of psychiatric patients in outpatient settings are prescribed multiple psychotropic medications (Mojtabai & Olfson, 2008). Polypharmacy increases the risk for these psychotropic-specific ADRs as well as the aforementioned negative outcomes. Questions of risk may be especially pertinent for populations in which conditions may be more challenging to treat, or for individuals with more complex clinical presentations.

Psychiatric Polypharmacy in Youth

Many studies investigating polypharmacy research focus on geriatric and older adult populations, as these subpopulations evidence higher prevalence of health problems and corresponding polypharmacy (Rambhade et al., 2012). However, the issues related to polypharmacy are not limited to adults. Newer research on polypharmacy in youth and small children is emerging, although this topic is less frequently studied in these populations. This is problematic, as the evidence base guiding polypharmacy prescription practices in youth is much more limited, even though the practice still routinely occurs. Studies estimate that 4-84% of youth are prescribed at least one psychotropic medication, and 14-52% of youth are prescribed two or more psychotropic medications, with rates varying across different study designs, treatment settings, and age groups (Chen et al., 2011; Comer et al., 2010; Dharni & Coates,

2018; Duffy et al., 2005; Medhekar et al., 2019; Olfson et al., 2002). Longitudinal trends indicate that psychotropic prescription and polypharmacy rates are increasing over time (McIntyre & Jerrell, 2009).

Most medication trials are first validated in adult populations, and an evidence base for youth populations may not yet be established for some medications (Crismon & Argo, 2009; Roberts et al., 2003). For many psychotropic medications, use in children under the age of 12 is considered off-label prescribing, as efficacy in this age group has not been established in research (Jensen et al., 1994; Malone et al., 1999). This lack of evidence is concerning as studies of polypharmacy note that when research is lacking, prescribers use their own clinical judgment and past anecdotal experience for decision-making (Möller et al., 2004). This could be particularly problematic given individual variability in children due to physiological developmental differences, even amongst youth in the same age range. There may also be significant differences across ethnicities and genders (Goldberg & Wagner, 2019). Additionally, the fact that youth are still developing at the time of psychotropic drug exposure requires medical professionals to adjust reference values typically used for monitoring side effects of such medications, such as body mass index and thyroid function thresholds (Correll & Carlson, 2006). This can complicate the process of assessing ADRs in children. Children may also be less likely to speak up about ADRs, perhaps due to a lack of understanding given their young age or because they feel unequipped to discuss such matters with healthcare providers (Goldberg & Wagner, 2019).

Psychotropic Medication ADRs in Youth

There are multiple potential ADRs associated with psychotropic medication use in children. Metabolic side effects may come in various forms, resulting in weight gain, weight

loss, Type 2 Diabetes Mellitus, and dyslipidemia (Correll & Carlson, 2006; Jerrell, 2010; Kubiszyn et al., 2012). Endocrine-related ADRs can result in thyroid dysfunction, growth retardation, and reduction in adult height, as well as polycystic ovarian syndrome in female patients (Correll & Carlson, 2006). Appetite disturbances may result in increases or decreases in appetite, dyspepsia, nausea, and vomiting (Jerrell, 2010; Kubiszyn et al., 2012). Other common ADRs include dizziness, sweating, blurred vision, insomnia, fatigue, sedation, concentration difficulties, impulsivity, and mood disturbances (Kubiszyn et al 2012; Lee et al 2015).

As with adult populations, antipsychotic use in children can be associated with more severe side effects. Youth are at higher risk than adults for antipsychotic-induced hyperprolactinemia, weight gain, and other metabolic abnormalities (Correll & Carlson, 2006). These metabolic side effects are especially troubling given that obesity and related concerns in childhood are linked to a variety of cardiovascular issues in adulthood, and obesity can have a negative impact on a child's mental health (Pringsheim, Panagiotopoulos et al., 2011). Youth prescribed these medications also commonly experience EPS, such as dystonia, akathisia, and parkinsonism (Crismon & Argo, 2009; Kubiszyn et al., 2012; Pringsheim, Doja et al., 2011). Other possible side effects include sedation, drooling, a decrease in absolute neutrophil count, and even cataracts (Pringsheim, Panagiotopoulos et al., 2011).

Selective serotonin reuptake inhibitors (SSRIs) are commonly prescribed as antidepressants and also have pediatric-specific concerns. SSRIs can sometimes lead to "activation" in youth, which is a cluster of symptoms associated with hyperarousal including impulsivity, restlessness, and insomnia (Luft et al., 2018). Youth aged 12 years or younger may be most at risk for activation ADRs (Garcia-Delgar et al., 2018). Other known ADRs associated with SSRIs for youth include tremors, tics, enuresis, sedation, affective blunting, profound

apathy, and akathisia (Peters & Connolly, 2012). Another concern of pediatric antidepressant use is increased risk of suicidal thoughts, which has resulted in the so-called black box criteria that must be reviewed with all patients and families before antidepressant therapy is initiated (Peters & Connolly, 2012).

Given the risk of these significant side effects and the complications that may occur during different developmental stages in pediatric populations, there have been published guidelines intended to help guide psychotropic medication practice for these individuals. For example, pharmacotherapy is not usually recommended as the only treatment intervention for youth with mental health diagnoses; psychotherapy and community support should be added when possible (American Academy of Child and Adolescent Psychiatry [AACAP], 2012) Researchers caution against psychotropic prescription for very young children aged six and under (Crismon & Argo, 2009). Initiation of medications during this time period has been associated with continued, chronic use, in addition to the concerns of consuming powerful medications during a time of extensive developmental growth (dosReis et al., 2014). Guidelines indicate attaining a detailed past medical and family history, a full medical/physical examination, completion of formal psychological assessment and diagnosis, and a thorough informed consent process with both patient and parents about the risks and benefits of such medications before prescription (Goldberg & Wagner, 2019; Gringras & McNicholas, 1999; McNally et al., 2007). Careful monitoring of ADRs and development (e.g., height, weight) should occur at regular time intervals (Gringras & McNicholas, 1999; Pringsheim, Panagiotopoulos et al., 2011). It is also recommended to try to decrease dosages to the lowest amounts, especially when medications have been prescribed for a longer time period (AACAP, 2012). Despite these recommendations,

there are often children who are prescribed high-risk medications such as antipsychotics without a prior psychological assessment or psychotherapy involvement (Olfson et al., 2010).

There are thus many additional considerations for prescribing psychotropic medications in youth compared to adults. For both populations, these risks quickly add up when multiple medications are involved. It is important for prescribers to be aware of groups at higher risk for psychotropic medication and polypharmacy in order to best implement the aforementioned guidelines.

Specific Subpopulations at Risk for Psychotropic Polypharmacy

Regardless of the patient's age, there are other risk factors that increase the probability of an individual being prescribed multiple medications. These include complex or multiple health needs, comorbidity, experiences of trauma and adversity, a history of behavioral issues like aggression, and justice-system involvement. These additional risks are discussed further below.

Individuals with Complex Medical & Mental Health Needs

Not surprisingly, multiple diagnoses increase the risk for polypharmacy. Increasing comorbidity typically indicates more complex symptomology and thus a greater number of needs that can be addressed through pharmacology. Comorbidity has been consistently associated with polypharmacy within various populations, both adult and pediatric (Comer et al., 2010; Duffy et al., 2005; McIntyre & Jerrell, 2009; Medhekar et al., 2019; Ninan et al., 2014; Rambhade et al., 2012). Individuals with higher symptom severity are also often prescribed multiple medications (Brenner et al., 2014). It is important to note that although these individuals may have increased need for polypharmacy to target multiple issues, their comorbid conditions inherently complicate the risk of ADRs and non-targeted systems being affected by medications. Thus, prescribers

must be cautious to ensure that specific medications are not contraindicated due to another condition.

There are also specific diagnoses indicative of chronic symptomology that are more likely to be treated with polypharmacy, including serious and persistent mental illness (SPMI; e.g., bipolar disorder and schizophrenia) and treatment-resistant depression (Duffy et al., 2005; Gallego et al., 2012; Millan, 2014). SPMI diagnoses are characterized by more severe symptoms such as psychosis and are associated with profound negative effects on activities of daily living and social functioning. Diagnoses designated treatment resistant have not been effectively treated thus far, indicating that multiple treatment avenues may be needed to properly address symptoms. Suicidality and self-harm are also markers of more serious symptomology, which often leads to pharmacotherapy and potentially polypharmacy (Fontanella et al., 2009).

Recent hospitalizations, including both general hospitalization for medical needs (Jokanovic et al., 2015; Rambhade et al., 2012) and inpatient psychiatric hospitalization (Björkenstam et al., 2013; Duffy et al., 2005; Gallego et al., 2012), are also associated with polypharmacy. Medication changes are common during hospitalization. Studies estimate that 47-78% of adolescents in inpatient psychiatric care have at least one medication change during their stay (Dean et al., 2006; Fontanella et al., 2009), and about 60% of such youth have medications added to their existing pre-hospitalization regimen (Blader, 2006). Physicians within the hospital often prescribe various medications to address an acute concern, but patients often continue these medications after they are released from the hospital. Additionally, longitudinal data illustrates that medications continue to be added up to 12 months post-discharge (Blader, 2006). Thus, individuals with multiple diagnoses, more complicated symptomology, or concerns requiring

hospitalization are more likely to be prescribed multiple medications than those without such characteristics.

Individuals who Experience Trauma

Trauma has also been linked to the prescription of psychotropic medications and polypharmacy. Adverse childhood experiences (ACEs), or experiences of abuse, neglect, and household dysfunction that occur prior to age 18, have been associated with increased rates of psychotropic medication prescription in adulthood (Anda et al., 2007; Koskenvuo & Koskenvuo, 2014) and other mental health outcomes that can lead to psychotropic pharmacotherapy, including alcoholism, drug abuse, depression, psychosis, and suicide attempts (Felitti et al., 1998; Varese et al., 2012; Whitfield et al., 2005). In fact, research has indicated a dose-response relationship between ACEs and such outcomes, meaning each additional ACE further increases the risk of detrimental outcomes (Anda et al., 2007; Felitti et al., 1998).

A history of trauma or maltreatment can also complicate diagnosis, as those who experience multiple or chronic traumatic stressors often have comorbid issues or may not fully meet diagnostic criteria for post-traumatic stress disorder (PTSD; Crismon & Argo, 2009; John et al., 2019). Diagnostic inaccuracy (i.e., overdiagnosis, underdiagnosis, and misdiagnosis) is common, as responses to trauma are often overlooked or misinterpreted (Hodas, 2006). For example, children who experience trauma may present with concentration problems, hyperactivity, and impulsivity that could be incorrectly identified as attention-deficit hyperactivity disorder (ADHD) if proper screening for trauma is not conducted. Youth diagnosed with ADHD are often prescribed stimulant medications, which may be contraindicated for those who have symptoms stemming from traumatic experiences. Similarly, adolescents may engage in substance abuse to self-medicate following traumatic experiences in childhood. This may lead to adults and

treatment providers focusing on the substance abuse (an externalizing behavior that is considered delinquent) as the central issue, rather than the trauma that precipitated such abuse. Substance abuse also increases the likelihood of revictimization and PTSD, creating a cycle of abuse, psychiatric symptoms, and illicit substance use. Subsequent treatment that is not trauma-informed may not be sufficient to alleviate the underlying problems, and as such many evidence-based treatments targeted at this subset of youth address both issues concurrently. Other ineffective interventions for youth who have experienced trauma include those that are punitive or shaming (Hodas, 2006), which may exacerbate existing symptoms.

Children who experience ACEs often become involved with child welfare systems and may be placed into foster care. These youth in foster care experience higher rates of psychotropic medication prescription as well as polypharmacy in comparison to non-systems youth, which is particularly true of those who enter care at a young age and those with higher symptom severity (Brenner et al., 2014; dosReis et al., 204; Zito et al., 2008). Many youth in foster care experience multiple out-of-home placements and for long periods of time. This residential instability presents unique obstacles for psychotropic medication prescription practices. Each movement to a new placement represents a disruption in care, which also presents emotional and attachment problems for the youth (Longhofer et al., 2011) as well as potential disruptions in access to care or care from a known medical provider. An important contributor to medication adherence is the presence of a consistent caregiver to assist the child with consent and management, which these youth often lack. Additionally, these children experience multilayered stigma of being victimized and lacking a "real" family, such that the additional stigma of psychotropic medication can feel even more ostracizing. As Longhofer and colleagues (2011) summarize, "Foster children

experience triple jeopardy: they endure maltreatment, they experience abrupt removal from families, and they live daily with prospects of unpredictable and unplanned transitions" (p. 399).

Residential instability may also lead to youth in foster care working with multiple prescribers, which is another risk factor for polypharmacy (Jokanovic et al., 2015; Medhekar et al., 2019; Rambhade et al., 2012). This could be unintentional; one prescriber may lack knowledge of what others are prescribing, especially if previous medical records are not transferred to new prescribers. Contrarily, once a medication is started by a physician, future prescribers may not discontinue it when transferred care, as new providers less familiar with the patient may rely on the assumption that the prescribed medication was necessary. Finally, established medication regimens may be altered to reflect a given prescriber's preferred medications for that presenting problem, again resulting in medication changes due to fluctuations in treatment providers rather than medical need. Overall, there are a multitude of factors relating to trauma and out-of-home placements that contribute to polypharmacy risk. Awareness of these factors has led to systems-involved youth in particular being targets of polypharmacy research and policy (Longhofer et al., 2011).

Justice-Involved Populations

Individuals involved with the criminal justice system are vulnerable to a range of negative outcomes that may be treated with psychotropic medications, including co-occurring mental health and substance use disorders, self-harm behaviors, and suicidality (Fazel et al., 2011; Ogloff et al., 2015). A meta-analysis by Griffiths et al. (2012) investigating psychotropic drug prescription among persons in prisons noted several important themes. First, offenders are at high risk for polypharmacy, with insufficient response to monotherapy and concerns about safety and adherence identified as common justifications for polypharmacy. Polypharmacy was

also commonly associated with high medication dosages, even at levels exceeding the recommended daily dose, and medications were often used for lengthy durations of time. Researchers also highlighted the lack of adherence to prescribing guidelines, particularly those that recommend monitoring side effects of high-dose medications with many associated ADRs.

Justice-involved youth face similar risks. Psychological disorders are common in juvenile justice populations, where many youth carry multiple mental health diagnoses (Kang et al., 2018; Lyons et al., 2013). Common diagnoses include conduct disorder, anxiety disorders, major depressive disorder, and substance use disorders. Many of these diagnoses can be treated with psychotropic medications, a method potentially preferred by prescribers if these concerns are comorbid and are viewed as contributors to aggression or other illegal behaviors. In one study of youth in state juvenile justice facilities, Lyons and colleagues (2013) noted that although the rate of psychotropic medication was low, almost half of those receiving any psychotropic medication were prescribed multiple medications in the 30 days following intake, ranging from 2-5 medications per youth.

Psychotropic medications, namely antipsychotics, are also prescribed more broadly in youth with behavioral issues commonly associated with delinquency, such as aggression, impulsivity, irritability, and disruptive behaviors (Blader, 2006; Pringsheim, Panagiotopoulos et al., 2011; Ninan et al., 2014). Further, increasing numbers of antipsychotics are prescribed off-label for youth with ADHD to address impulsivity and behavior problems (Pringsheim, Panagiotopoulos et al., 2011). Several studies note the severity of behavioral problems, especially aggression, specifically increase the risk for polypharmacy and ADRs (Blader, 2006; Ninan et al., 2014) in these youth, many of whom come into contact with the justice system due to problems with aggression and delinquency. Thus, delinquency and justice-system

involvement, as well as associated externalizing behavioral issues, increase risk for polypharmacy.

Current Study

Importantly, the symptoms and characteristics of persons in these high-risk groups associated with polypharmacy often overlap, especially since these risk factors often correlate with one another. Research illustrates that increasing numbers of ACEs are associated with both physical and mental health problems (Felitti et al., 1998; Varese et al., 2012), including externalizing problems that may present as disobedience, inattention, aggression, and substance abuse (Carliner et al., 2017). These behavior problems may initiate contact with the criminal justice system. High prevalence rates of trauma, mental health diagnoses, and suicidality are common amongst justice-involved youth (Björkenstam et al., 2013; Fox et al., 2015; Logan-Greene et al., 2017). Further, their behavioral histories are often characterized by aggression and delinquency, as well as transitions in medical and psychiatric care prompted by child welfare or justice system involvement.

Adolescents who engage in sexually abusive behavior represent a unique subpopulation of youth who face a multitude of risks for polypharmacy practices: youthful age, complex medical and mental health needs, experiences of trauma and out-of-home placements, justice system involvement, and histories of behavioral problems in a variety of settings. Despite the connections of polypharmacy to certain characteristics of said youth, no research to date has examined this population specifically. Some studies have explored prescribing practices for youth in general residential care, noting the highest rates of polypharmacy for individuals with behavior problems (Huefner et al., 2017). However, it is unknown if behavior problems that are sexual in nature pose further risk of polypharmacy. Research also suggests that despite overall

trends of increasing medications upon admission to a treatment facility, youth whose numbers of medications decreased were released to less restrictive settings at discharge, indicating a benefit to medication reconciliation and decreasing polypharmacy when possible (van Wattum et al., 2013). Given the risk of detrimental outcomes associated with pediatric psychotropic polypharmacy, in addition to the risks already faced by vulnerable, justice-involved youth, understanding correlates of polypharmacy in a sample of vulnerable youth may inform future prevention and intervention strategies to promote optimal care.

The current study will use an existing archival dataset of a sample of adolescents who have engaged in sexually abusive behaviors to address gaps in the literature and inform effective treatment practices with this population. Given the high rates of psychiatric comorbidity within the population and the corresponding risk for between-class comedication, which may lead to higher risk of ADRs, polypharmacy practices will be examined focusing on specific classes of psychotropic medications. In addition, the between-class focus will allow for more generalizable results. The following research aims and corresponding hypotheses will be the focus of this study:

Research Aim 1

Investigate patterns of psychotropic medication prescription and polypharmacy across different diagnostic categories, levels of comorbidity, race/ethnicities, and ages.

- *Hypothesis 1a:* There may be differential associations between polypharmacy and participant characteristics by age, race, and type of diagnostic presentation.
- *Hypothesis 1b:* Participants with higher levels of comorbidity (i.e., greater numbers of diagnoses) will evidence higher levels of polypharmacy.

Research Aim 2

Investigate psychiatric, trauma- and instability-related, and aggressive/criminal variables associated with polypharmacy in past literature within principal components analysis (PCA) to understand their relationships with one another, as well as their relationships with psychotropic medication prescription and polypharmacy.

- *Hypothesis 2a:* Conducting PCA as a data reduction technique on the variables of interest will result in meaningful indices.
- *Hypothesis 2b:* Indices derived from the PCA will be associated with the following outcomes: younger age of initiation of psychotropic medication and higher number of current drug classes.
- *Hypothesis 2c*: Participants with more aggressive/problematic behavioral issues will be more likely to be prescribed antipsychotic and stimulant/ADHD medications.

Research Aim 3

Explore the impact of admission to residential care on psychotropic prescription practices. Given that recent hospitalizations, trauma, residential instability, and court involvement are associated with polypharmacy in the literature, participants may exhibit increases in polypharmacy after admission to the treatment facility.

- *Hypothesis 3a:* Participants will exhibit greater degrees of psychotropic polypharmacy after admission to the treatment facility, such that they are more likely to have medications added than subtracted.
- *Hypothesis 3b:* Differences in polypharmacy, whether positive or negative, will be examined based on significant predictors of polypharmacy determined in earlier analyses involving the PCA indices.

Chapter 2. Methods

Data Collection & Sample

This study utilized an archival dataset collected from a nonprofit residential treatment facility for adolescents who have engaged in sexually abusive behaviors. Data collection efforts were sponsored by funding from the East Tennessee State University Research Development Committee's Major Grant program. Data were collected by the primary investigator and trained undergraduate and graduate research assistants with approval from the East Tennessee State University Campus Institutional Review Board and the board of directors of the treatment facility. Data were collected from November 2014 to July of 2017.

Data were obtained from various documents within participants' records, including: admission and discharge summaries, psychological testing results, records from the state Division of Children's Services (DCS), records from law enforcement, probation, or other residential placements, court documents, school records, and other treatment evaluations or records available from the residential facility. Available data varied within each participant's file due to differences in length of stay at the facility, county of origin, and medical/psychological complexity; some participant files yielded more useable data than others.

A total of 295 participants' files were available for use. The average age at admission to the treatment facility ranged from 10 to 17, with an average age of 14.80 years old (SD = 1.56). The majority of participants were male (98.3%, n = 290), and five participants were female. Eighty-three percent of the sample identified as White/Caucasian (n = 245), followed by African American/Black (9.5%, n = 28), Multiracial (4.4%, n = 13), Other/Unknown (2.4%, n = 7), and Hispanic (0.7%, n = 2). Most participants were referred to the treatment facility by DCS (68.5%, n = 202), followed by court representatives (20.7%, n = 61), mental health providers (4.4%, n =

13), parents/guardians (3.4%, *n* = 10), unknown (2%, *n* = 6), other (0.7%, *n* = 2), and insurance representatives (0.3%, *n* = 1).

Variables

As this study utilized archival data, a total of 44 variables were selected from the pre-collected dataset that I hypothesized were related to the three domains discussed earlier in this paper: complex health needs, trauma and instability, and aggressive/criminal behavior. As these variables would later be entered into the PCA to be reduced, a large number of variables were selected with the understanding that variables that did not fit well would be removed in later, iterative steps of the PCA. These variables included specific psychiatric diagnoses, ACEs, details of out-of-home placements, and data from criminal records. The specific diagnoses included were ADHD, trauma-related disorders, psychotic disorders, oppositional defiance disorder (ODD), conduct disorder (CD), and a diagnostic category including intellectual developmental disorder/autism spectrum/communication (IAC) disorders. Two demographic variables were also recorded. Finally, a total of nine polypharmacy variables were selected or created as outcome variables. The presence/absence of six different medication classes were recorded from participant records. A variable representing the cumulative number of current medication classes (ranging from zero to six) in use for each participant was calculated. Lastly, a variable representing the change in cumulative drug classes post-admission to the treatment facility was created by subtracting the number of previous drug classes prescribed before admission (if known) from the number of current drug classes being prescribed. Due to the nature of archival data collection and the possibility of missing data, descriptive analyses were conducted to assess the frequency of missing data per variable. See Tables 1 and 2 for lists of variables, their coding mechanisms, descriptive statistics, and missingness.

Table 1

Independent Variables, Coding Mechanisms, and Descriptive Statistics

Variable	Coded as:	*M* (*SD*), Range	*n* (%)	Missing data *n* (%)
Demographic variables				
Race/ethnicity	White = 1, non-White = 2		245 (83.1%) White	0
Age at admission	Age in years	14.8 (1.6), 10-17		1.0%
PCA variables				
Total # of diagnoses*	Count # of diagnoses, possible values of 0-21	4.1 (2.7), 0-12		3 (1.0%)
ADHD	No = 0, Yes = 1		209 (70.8%)	4 (1.4%)
Trauma-related disorder	No = 0, Yes = 1		71 (24.1%)	12 (4.1%)
Psychotic disorder	No = 0, Features = 1, Yes = 2		18 (6.1%) Yes, 15 (5.1%) w/ features	10 (3.4%)
ODD	No = 0, Yes = 1		91 (30.8%)	10 (3.4%)
Conduct disorder	No = 0, Yes = 1		102 (34.6%)	8 (2.7%)
IDD, autism spectrum, or communication disorder	None = 0, Yes for at least one disorder = 1		87 (29.5%)	8 (2.7%)
Hx of outpatient counseling	No = 0, Yes = 1		261 (88.5%)	7 (2.4%)
Hx of suicide attempts	No = 0, Yes = 1		68 (23.1%)	11 (3.7%)
Hx of suicidal ideation	No = 0, Yes = 1		131 (44.4%)	9 (3.1%)
Age at 1st documented suicidal ideation	Age in years, 888 if no suicidal ideation documented	12.3 (3.1), 4-17		42 (14.2%)
Self-harm bx	No = 0, Unclear = 1, Yes = 2		107 (36.3%) Yes, 16 (5.4%) Unclear intent	9 (3.1%)
# of psychiatric inpatient admissions	Count # of admissions	1.0 (1.8), 0-13		5 (1.7%)
# of out-of-home placements	Count # of placements	5.5 (6.4), 0-64		1 (0.3%)

Duration in out-of-home placements	# of years in placements prior to admission	3.4 (3.9), 0-16		23 (7.8%)
# of schools attended	Count # of schools attended	5.0 (3.5), 1-30		45 (15.3%)
ACEs: Physical abuse	No = 0, Yes = 1		151 (51.2%)	0
Emotional abuse	No = 0, Yes = 1		109 (36.9%)	0
Sexual abuse	No = 0, Yes = 1		182 (61.7%)	0
Emotional neglect	No = 0, Yes = 1		86 (29.2%)	0
Physical/medical neglect	No = 0, Yes = 1		113 (38.3%)	0
Parental divorce	No = 0, Yes = 1		247 (83.7%)	0
Domestic violence	No = 0, Yes = 1		121 (41.0%)	0
Caregiver substance use	No = 0, Yes = 1		190 (64.4%)	0
Caregiver mental illness	No = 0, Yes = 1		137 (46.4%)	0
Caregiver incarceration	No = 0, Yes = 1		122 (41.4%)	0
# of arrests	Count # of arrests	2.1 (2.6), 0-14		6 (2.0%)
Duration of time incarcerated	# of years; "Brief" or unspecified = 0.5, 0-4 months = 0.3, 5-8 months = 0.6, 9-12 months = 1	0.1 (0.3), 0-2		23 (7.8%)
Age at 1st arrest	Age in years, 888 if never arrested	13.3 (1.9), 7-17		11 (3.7%)
Hx of aggression	No = 0, Yes = 1		258 (87.5%)	8 (2.7%)
Age at 1st aggressive bx	Age in years, 888 if no hx of aggression	9.1 (3.8), 2-17		108 (36.6%)
Hx of animal cruelty	No = 0, Yes = 1		94 (31.9%)	11 (3.7%)
Hx of impulsivity	No = 0, Yes = 1		106 (35.9%)	13 (4.4%)
Hx of anger dyscontrol (e.g., temper tantrums)	No = 0, Yes = 1		130 (44.1%)	11 (3.7%)
# of nonsexual violent arrests	Count # of arrests	0.4 (0.9), 0-8		8 (2.7%)
Placements d/t bx problems	No = 0, Yes = 1		116 (39.3%)	13 (4.4%)
Hx of behavioral problems at school	No = 0, Yes = 1		235 (79.7%)	11 (3.7%)

Violent bx at school	No = 0, Yes = 1		166 (56.3%)	15 (5.1%)
Sexual bx at school	No = 0, Yes = 1		83 (28.1%)	15 (5.1%)
Sexual offenses & behaviors:				
Adult contact victims	No = 0, Yes = 1		18 (6.1%)	10 (3.4%)
Child contact victims	No = 0, Yes = 1		257 (87.1%)	10 (3.4%)
Violent 1st sexual offense	No = 0, Yes = 1		30 (10.2%)	22 (7.5%)
Age at 1st sexual offense	Age in years, 888 if no sexual offense	11.7 (2.9), 4-17		16 (5.4%)
Placements d/t inappropriate sexual bx	No = 0, Yes = 1		195 (66.1%)	13 (4.4%)

Note. Bx =behavior, hx = history. Child contact victims and adult contact victims not mutually exclusive, as some participants may have both. *21 diagnoses include: Intellectual or developmental disability, Specific learning disorder, Autism spectrum disorder, Communication disorder, Motor disorder, Elimination disorder, Feeding disorder, Sleep disorder, Reactive attachment disorder, Attention-deficit/hyperactivity disorder, Mood disorder, Anxiety disorder, Obsessive-compulsive or related disorder, Psychotic disorder, Adjustment disorder, Trauma-related disorder, Oppositional defiant disorder, Conduct disorder, Intermittent explosive disorder, Other impulse control disorder, and Substance abuse disorder.

Table 2

Dependent Variables, Coding Mechanisms, and Descriptive Statistics

Dependent Variable	Coded as:	*M* (*SD*), Range	*n* (%)	Missing data *n* (%)
Psych Medication Age	Age in years that client began taking psychotropic meds, 888 if no hx of psych meds	7.9 (4.0), 0-16		131 (44.4%)
Current Medications: Drug Classes				
1. Antidepressants	No = 0, Yes = 1		156 (52.9%)	12 (4.1%)
2. Mood stabilizers	No = 0, Yes = 1		145 (49.2%)	12 (4.1%)
3. Antipsychotics	No = 0, Yes = 1		114 (38.6%)	12 (4.1%)
4. Anxiety medications	No = 0, Yes = 1		155 (52.5%)	12 (4.1%)
5. Stimulants/ADHD medications	No = 0, Yes = 1		110 (37.3%)	12 (4.1%)
6. Medications for side effects	No = 0, Yes = 1		14 (4.7%)	12 (4.1%)
Cumulative classes including side effect medications	Count # of current drug classes	2.5 (1.9), 0-6		12 (4.1%)
Change in cumulative classes, past vs. current medications	Difference between past cumulative classes & current cumulative classes, possible values of -6 to +6	.40 (1.7), -5 to +5		17 (5.8%)

Data Analytic Plan

My objective is to better understand how various factors relate to different measurements of psychotropic medication use and polypharmacy. Specific hypotheses and exploratory aims are discussed below. The predicted hypotheses were pre-registered and time stamped on the Open Science Framework web server. The following study design was also pre-planned and included on the study's preregistration, which can be found at the following link: https://osf.io/wxs5r/. Analyses were conducted in IBM SPSS Statistics version 26.23.1. For group differences (*t*-tests and χ^2), data were excluded listwise. For regression analyses, data were excluded pairwise. The standard $p < .05$ criteria for a two-tailed test was utilized for determining significance. Outliers were not excluded from the analyses.

Research Aim 1

Hypothesis 1a: There may be differential associations between polypharmacy and participant characteristics by age, race, and type of diagnostic presentation. Exploratory analyses were conducted to examine relationships between polypharmacy practices, age, and race/ethnicity. Due to the majority of participants being White, race/ethnicity was recoded as White (coded as 1) and non-White (coded as 2).

A linear regression analysis was conducted to examine the effect of age at admission and number of medication classes prescribed. Independent samples *t*-tests were conducted to test for significant differences between the number of medication classes prescribed for White and Non-White participants. χ^2 analyses were completed for each medication class and racial group (White versus non-White). For each specific diagnostic category (ADHD, trauma-related disorder, psychotic disorder, ODD, CD, and IAC disorders), the following were conducted: 1) descriptive statistics for the mean number of medication classes prescribed for participants with

that diagnosis, 2) the percentage of participants with that diagnosis that were prescribed each medication class, 3) *t*-tests and χ^2 analyses to examine if these polypharmacy variables were significantly different in participants with the diagnosis compared to those without the diagnosis. Note that for this hypothesis only, the psychotic disorder diagnosis variable was dichotomized, such that participants with features of psychosis were grouped together with those with a formal psychotic disorder diagnosis.

Hypothesis 1b: Participants with higher levels of comorbidity (i.e., greater numbers of diagnoses) will evidence higher levels of polypharmacy. Linear regression analyses were conducted to examine if a significant relationship exists between number of cumulative diagnoses and two polypharmacy variables: younger age of initiation of psychotropic medication and number of current drug classes prescribed.

Research Aim 2

As there are many potential independent variables that can inform polypharmacy in this population, I first used Principal Component Analysis (PCA), a data reduction technique designed to create one or more index variables from a larger set of measured variables. This analysis will help illustrate how the individual variables correlate with one another, resulting in components or indices that can be entered into later regression analyses as independent variables. The aim of the PCA is to simplify the statistical analyses to achieve more meaningful results and to account for collinearity amongst individual predictor variables.

Hypothesis 2a: Conducting PCA as a data reduction technique on the variables of interest will result in meaningful indices. For the first step, the 44 independent variables were entered into the PCA. No rotation was utilized in this step to best represent true patterns and associated correlations within the data. The corresponding scree plot and Eigenvalues were

examined to help determine which component structure might fit the data best. Further steps of the PCA were conducted using an iterative approach to reduce the data to best fit the proposed components, utilizing the Oblimin with Kaiser Normalization rotation for each subsequent PCA. This rotation is appropriate for oblique components, as it was expected that components could be correlated with one another (Kahn, 2006). A cutoff of 0.40 for structure coefficients was selected for inclusion of variables into the components. To eliminate variables that did not fit well into any components, a cutoff of 0.30 for all components was utilized as a threshold. That is, variables that did not load on any components at 0.30 or above following the second iteration of PCA were removed before continuing the iterative process of further PCAs. Imputation of means for missing data was utilized in all steps of the PCA as few variables yielded notable amounts of missingness (see Table 1).

Hypothesis 2b: Indices derived from the PCA will be associated with the following outcomes: younger age of initiation of psychotropic medication and higher number of current drug classes; participants with more aggressive/problematic behavioral issues will be more likely to be prescribed antipsychotic and stimulant/ADHD medications. These hypotheses were exploratory and dependent upon the results of the PCA. After a PCA model with appropriate fit was determined, factor scores were computed using the Thurstone least squares regression method, which predicts the location of each individual on the component and allows for the components to be used as independent variables in further regression analyses (Distefano, Zhu, & Mindrila, 2008). The factor scores were input as independent variables in separate multiple regression analyses for two dependent variables: age of initiation of psychotropic medication and number of current drug classes.

Hypothesis 2c: Participants with more aggressive/problematic behavioral issues will be more likely to be prescribed antipsychotic and stimulant/ADHD medications. The aforementioned factor scores were also input as independent variables in separate logistic regression analyses for two dependent variables: current antipsychotic medications and current stimulant/ADHD medications.

Research Aim 3

Hypothesis 3a: Participants will exhibit greater degrees of psychotropic polypharmacy after admission to the treatment facility, such that they are more likely to have medications added than subtracted. Descriptive statistics of the change variable that subtracts the number of previous drug classes prescribed from the number of current drug classes prescribed were analyzed, and a histogram was created to visually represent this data.

Hypothesis 3b: Differences in polypharmacy, whether positive or negative, will be examined based on significant predictors of polypharmacy determined in earlier analyses. Two regressions were conducted with the change variable as the dependent variable: one with number of diagnoses as the independent variable, and one with the PCA components as independent variables.

Chapter 3. Results

Descriptive statistics of each variable can be found in Tables 1 and 2. Psychiatric concerns and diagnoses were prevalent in the sample. The average number of diagnoses was 4.1, and the maximum number was 12. Regarding specific diagnoses, the most common was ADHD (70.8%), followed by conduct disorder (34.6%), ODD (30.8%), IAC disorders (29.5%), trauma-related disorders (24.1%), and psychotic disorders (6.1%). A large majority of participants (88.5%) had received previous outpatient counseling. Notably, elevated rates of suicidality were evidenced in the sample, with almost half (44.4%) of participants having a history of suicidal ideation and 19% of participants having a history of suicide attempts.

Indicators of instability and trauma were also common. The average number of out-of-home placements was 5.5, and the maximum number was 64. The average duration of time in out-of-home placements was 3.4 years, with maximum of 16 years. On average, participants attended five different schools; one participant attended 30 schools. ACEs were common, with the most prevalent ACEs being parental divorce, caregiver substance abuse, sexual abuse, and physical abuse. All four of these ACEs occurred in over half of the sample.

Many of the participants' histories were characterized by behavioral problems. A large majority of participants evidenced a history of aggression (87.5%). Prevalence rates of anger dyscontrol (44.1%), impulsivity (35.9%), and animal cruelty (31.9%) were also notable. Many participants exhibited behavioral problems at both home and school. The average number of arrests was 2.1, though duration of incarceration rates were low ($M = 0.1$ years). Most participants had sexual crimes with child contact victims (87.1%), but very few had adult contact victims (6.1%).

With regard to polypharmacy, the average age of initiation of psychotropic medications was 7.9 years, though several participants began taking psychotropic medications before the age of one. Antidepressant (52.9%), anxiety (52.5%), and mood stabilizer (49.2%) medications were most common, though antipsychotics (38.6%) and ADHD/stimulant medications (37.3%) were also prevalent. Few participants (4.7%) were prescribed medications for side effects. The average number of medication classes currently prescribed was 2.5, with almost one-fifth of participants prescribed five or six medication classes.

Due to the nature of archival data collection from historical records, missing data is possible, as records may lack details from prior years, especially for participants with particularly unstable lives or those who experienced maltreatment at very young ages. Four variables had notable amounts of missing data (>10%): age at first aggressive behavior (36.6%), number of schools attended (15.3%), age at first documented suicidal ideation (14.2%), and age of initiation of psychotropic medication (44.4%). It is important to note the significant amount of missingness for age of initiation of psychotropic medication, as analyses with this dependent variable will yield smaller sample sizes that may limit statistical power.

Research Aim 1

Hypothesis 1a: There may be differential associations between polypharmacy and participant characteristics by age, race, and type of diagnostic presentation. Multiple regression analysis was used to test the ability of age at admission to significantly predict the cumulative number of medication classes currently prescribed (see Table 3). The results of the regression indicated that age was not a significant predictor, and the overall model was not significant.

Table 3

Regression Analysis Summary for Age at Admission Predicting Number of Medication Classes (n = 282)

Variable	*B*	*SE B*	β	*t*	*p*
(Intercept)	1.67	1.06		1.58	.12
Age at admission	.05	.07	.04	.74	.46

Note. R^2 = .00, *F*=.55

An independent samples t-test was conducted to examine group differences in cumulative number of medication classes currently prescribed based on participant race. There was no significant effect for race, $t(281) = 1.49$, $p = .08$, despite White participants ($n = 239$, $M = 2.52$, $SD = 1.83$) being prescribed more medication classes on average than non-White participants ($n = 44$, $M = 2.07$, $SD = 2.03$). Regarding specific medication classes, there was a significant association between race and current antidepressant medications ($\chi^2(1) = 5.73$, $p < .05$), such that White participants were more likely to be prescribed antidepressants. No associations were found between race and current mood stabilizer ($\chi^2(1) > = .70$, $p = 0.10$), antipsychotic ($\chi^2(1) > = .06$, $p = 0.81$), anxiety ($\chi^2(1) > = 2.82$, $p = 0.09$), stimulant ($\chi^2(1) > = 0.09$, $p = 0.76$), or side effect ($\chi^2(1) > = 2.71$, $p = 0.10$) medications.

Table 4 summarizes the findings of analyses specific to each diagnostic category, with significance denoted for *t*-test and χ^2 comparisons between individuals with or without each diagnosis. Note that the diagnostic categories are not mutually exclusive across the entire sample, as some participants have multiple diagnoses. The diagnostic categories with the highest mean numbers of medication classes were psychotic disorders ($M = 3.97$), trauma-related disorders ($M = 3.55$), and IAC disorders ($M = 3.13$). Antidepressants were most commonly prescribed for trauma-related disorders (82%) and psychotic disorders (88%), though all

diagnostic categories exhibited prevalence rates of individuals prescribed antidepressants higher than 60%. A similar trend emerged for mood stabilizer medications. Anxiety medications were most prevalent for psychotic disorders (84%) and trauma-related disorders (75%). Antipsychotics were prescribed for about half of participants with ADHD, CD, and ODD, while rates of antipsychotic prescription were upwards of 60% for the diagnostic categories of trauma-related disorders, psychotic disorders, and IAC disorders. About half of individuals in each diagnostic category were prescribed ADHD medications/stimulants. Prevalence rates of medications for side effects were low except for those with psychotic disorders, for whom nearly 20% were prescribed such medications.

Table 4

Descriptive Statistics of Polypharmacy Variables by Diagnostic Category

Diagnostic category	# of med classes *M* (*SD*)	Antidepressants	Mood stabilizers	Antipsychotics	Anxiety meds	ADHD meds/ stimulants	Meds for side effects
ADHD (*n*=202)	2.96 (1.73)	63.37%**	60.89%**	49.01%**	63.37%**	53.96**	.05%
Trauma-related (*n*=71)	3.55** (1.49)	81.69%**	77.46%**	61.97%**	74.65%**	49.30%*	9.86%*
Psychotic (*n*=32)	3.97** (1.31)	87.50%**	78.13%**	68.75%**	84.38%**	59.38%**	18.75%**
ODD (*n*=87)	2.94 (1.84)	64.37%*	63.22%**	49.43%*	60.92%	50.57%**	5.75%
CD (*n*=97)	2.98** (1.78)	64.95%*	63.92%**	49.48%*	64.95%**	47.42%*	7.22%
IAC disorder (*n*=87)	3.13** (1.74)	62.07%	70.11%**	62.07%**	63.22%	45.98%	9.20%*

Note. ADHD = attention-deficit/hyperactivity disorder, ODD = oppositional defiant disorder, CD = conduct disorder, IAC = intellectual developmental disability/autism spectrum/communication disorder, meds = medications.

*$p < .05$, **$p < .01$. Significance levels indicate the presence or absence of significant differences between participants with and without the disorder resulting from *t*-tests and χ^2 analyses.

Hypothesis 1b: Participants with higher levels of comorbidity (i.e., greater numbers of diagnoses) will evidence higher levels of polypharmacy. Multiple regression analysis was used to test if number of diagnoses significantly predicted the age of initiation of psychotropic medication (see Table 5). The results of the regression indicated that number of diagnoses was not a significant predictor, and the overall model was not significant.

Table 5

Regression Analysis Summary for Number of Diagnoses Predicting Age of Initiation of Psychotropic Medications (n=118)

Variable	*B*	*SE B*	β	*t*	*p*
(Intercept)	8.20	.69		11.93	.00**
Number of diagnoses	-.08	.14	-.05	-.55	.58

Note. R^2 = .00, *F*=.31, **p < .01

A second multiple regression analysis was conducted to test if number of diagnoses significantly predicted the number of medication classes currently in use (see Table 6). The results of the regression indicated number of diagnoses significantly predicted number of current medication classes (β = .38, p < .001), explaining 28.5% of the variance (R^2 = .29, $F(1,281) = 113.62$, p < .001).

Table 6

Regression Analysis Summary for Number of Diagnoses Predicting Number of Medication Classes (n = 283)

Variable	*B*	*SE B*	β	*t*	*p*
(Intercept)	.90	.17		5.16	.00**
Number of diagnoses	.38	.04	.54	10.66	.00**

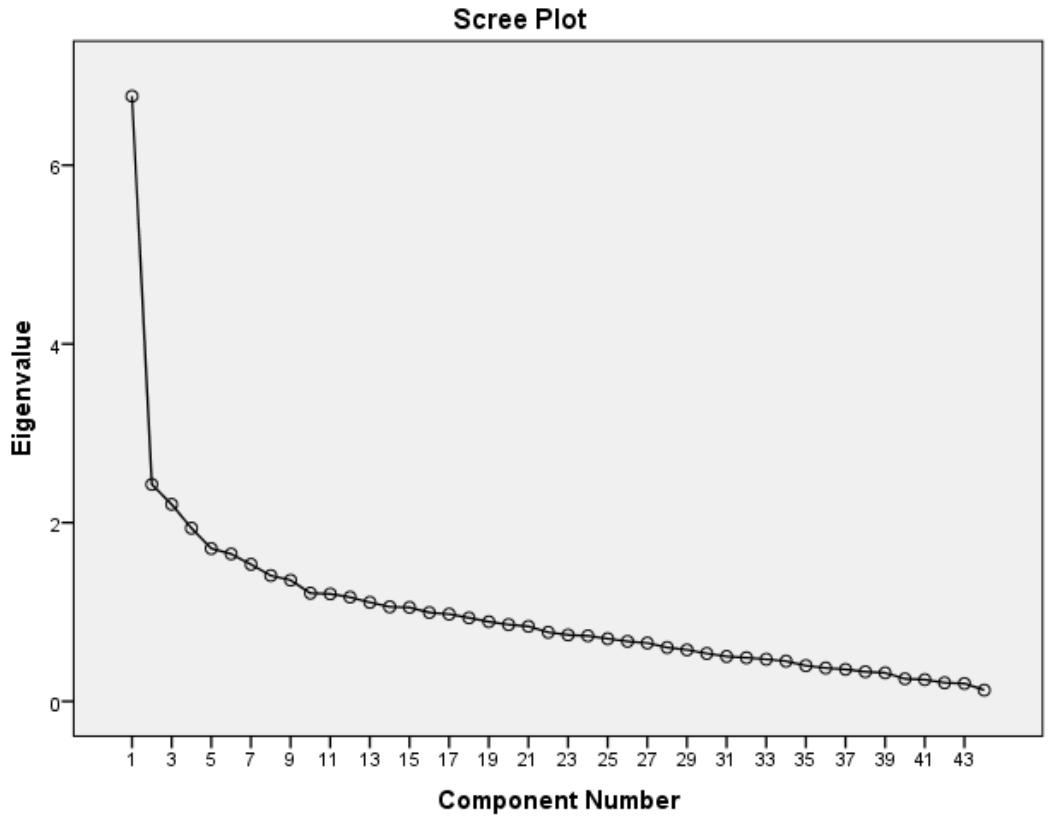
Note. R^2 = .29, *F*=113.62**, **p < .01

Research Aim 2

Hypothesis 2a: Conducting PCA as a data reduction technique on the variables of interest will result in meaningful indices. The initial step of the PCA included all 44 variables of interest, and no rotation was utilized (see Figure 1).

Figure 1

Scree Plot of the First Iteration of Principal Component Analysis



Kaiser's criterion (i.e., retaining the number of factors with Eigenvalues greater than one) suggested a 15-component solution. Examining the scree plot visually (i.e., "scree test") suggested a four-component solution. The second iteration of PCA included all 44 variables of interest and utilized the Oblimin with Kaiser Normalization rotation. Given the results of the scree test, a four-component solution was examined. The four-component solution explained 30.32% of the variance. After examining the pattern matrix, seven variables did not meet the

0.30 loading threshold for any of the components: age at first suicidal ideation, number of schools attended, history of animal cruelty, age at first sexual offense, violent first sexual offense, adult contact victims, and placements due to history of inappropriate sexual behaviors. Thirteen of the remaining 37 variables yielded loadings higher than the 0.30 inclusion threshold but did not load at 0.40 or above on any of the resulting components. These, however, were retained, as they did evidence some degree of relationship with the components. The four-component solution PCA was run again after removing the seven variables that did not meet the inclusion threshold.

The resulting four-component solution explained 34.51% of the variance, and all 37 variables met the 0.30 inclusion threshold. Eleven variables did not load at 0.40 or above on any of the components, though each of these loaded at 0.30 or above on a single component, suggesting some level of concordance with the variables associated with that component. Other alternative models were tested, including a three-component solution, but the final four-component model was retained. See Tables 7 and 8 for the pattern matrix of the final solution and component correlation matrix.

Table 7

Pattern Matrix of Final Solution of Principal Components Analysis

	Component				Variance
Variable	1	2	3	4	Explained
Component 1: Psychiatric concerns					17.17%
# of inpatient admissions	**.661**				
Hx of suicide attempts	**.590**				
Hx of suicidal ideation	**.613**				
Hx of self-harm bx	**.600**				
Cumulative # of diagnoses	**.751**				

ADHD	**.458**				
Psychotic disorder	**.440**				
Trauma-related disorder	**.504**				
IAC disorder	**.402**				
ODD	.374				
Conduct disorder	.326				
# of out-of-home placements	**.522**				
Placements d/t bx problems	**.446**		.301		
Age at 1st aggressive bx	-.366				
Hx of impulsivity	.336				
Hx of anger dyscontrol	.376				
Component 2: ACEs					6.52%
Emotional abuse		**.580**			
Physical abuse		**.640**			
Sexual abuse		.393			
Emotional neglect		**.678**		-.344	
Physical/medical neglect		**.685**		-.340	
Parental divorce		**.453**			
Domestic violence		**.643**			
Caregiver substance use		**.555**			
Caregiver mental illness		**.408**			
Caregiver incarceration		**.463**			
Duration in out-of-home placements		.303			
Component 3: Justice-system involvement					5.73%
# of arrests			**.823**		
Age at 1st arrest			**-.442**		
# nonsexual violent arrests			**.691**		
Duration of time incarcerated			.335		
Component 4: Aggression & behavioral problems					5.09%
Hx aggression				**.423**	

Bx problems at school	.314	**.608**
Violent bx at school	.350	**.535**
Sexual bx at school		.316
Child contact victims		.343
Hx of outpatient counseling		.367

Note. ADHD = attention-deficit/hyperactivity disorder, bx = behavior, d/t = due to, hx = history, IAC = intellectual developmental disability/autism spectrum/communication disorder, ODD = oppositional defiant disorder. The extraction method was principal component with an oblique (Oblimin with Kaiser Normalization) rotation. Factor loadings above .40 are in bold.

Table 8

Component Correlation Matrix of Four-Component Solution

Component	1	2	3	4
2	.259	-		
3	.107	.104	-	
4	.057	.087	-.024	-

Component 1 contained variables primarily associated with psychiatric symptoms, including diagnoses, suicidality, and inpatient admissions. Component 1 also included variables relating to aggression and behavioral problems (i.e., impulsivity, anger dyscontrol, and behavioral problems), which are often symptoms of psychiatric diagnoses. Additionally, Component 1 included two variables related to out-of-home placements: number of placements and placements due to behavioral problems. Component 2 contained the ACE variables and the duration of out-of-home placements. Component 3 contained variables directly related to criminal justice system involvement, including arrests and incarceration. Component 4 included variables relating to behavioral problems and aggression, as well as outpatient counseling and child contact victims.

Hypothesis 2b: Indices derived from the PCA will be associated with the following outcomes: younger age of initiation of psychotropic medication and higher number of current drug classes. Multiple regression analysis was conducted to examine if the four components from the PCA significantly predicted the age of initiation of psychotropic medication (see Table 9). The results of the regression indicated no significant predictors, and the overall model was not significant.

Table 9

Regression Analysis Summary for PCA Components Predicting Age of Initiation of Psychotropic Medication (n=118)

Variable	*B*	*SE B*	β	*t*	*p*
(Intercept)	7.88	.37		21.14	.00**
C1: Psychiatric concerns	-.49	.39	-.12	-1.25	.21
C2: ACEs	-.05	.39	-.01	-.13	.89
C3: Justice-system involvement	.02	.38	.00	.04	.97
C4: Aggression & behavioral problems	-.05	.38	-.01	-.14	.89

Note. R^2 = .02, F=.46, **p < .01

A second multiple regression analysis was conducted to examine if the four components significantly predicted the number of medication classes currently in use (see Table 10). The results of the regression indicated Component 1: Psychiatric concerns (β = 1.00, p < .001) and Component 2: ACEs (β = .30, p < .01) were significant predictors, and the overall model was significant (R^2 = .39, F(4,278) = 43.50, p < .001).

Table 10

Regression Analysis Summary for PCA Components Predicting Number of Medication Classes (n=283)

Variable	*B*	*SE B*	β	*t*	*p*
(Intercept)	2.45	.09		28.02	.00**
C1: Psychiatric concerns	1.00	.09	.54	10.99	.00**
C2: ACEs	.30	.09	.16	3.30	.00**
C3: Justice-system involvement	.15	.09	.08	1.64	.10
C4: Aggression & behavioral problems	.10	.09	.05	1.13	.26

Note. R^2 = .39, F=43.50**, **p < .01

Hypothesis 2c: Participants with more aggressive/problematic behavioral issues will be more likely to be prescribed antipsychotic and stimulant/ADHD medications. A logistic regression was performed to ascertain the effects of each component from the PCA on the likelihood that participants are prescribed antipsychotic medications (see Table 11). The model was statistically significant and accounted for 33% (Nagelkerke R^2) of the variance. Component 1: Psychiatric concerns and Component 2: ACEs were significant predictors, such that increasing scores on such components were associated with an increased likelihood of being prescribed antipsychotic medications.

Table 11

Regression Analysis Summary for PCA Components Predicting Antipsychotic Medications (n = 283)

Variable	*B*	*SE*	*Wald*	*df*	*p*	Exp(*B*)	95% CI for EXP(*B*)
C1: Psychiatric concerns	1.00	.16	38.22	1	.00**	2.71	1.98-3.72
C2: ACEs	.52	.15	11.83	1	.00**	1.68	1.25-2.25
C3: Justice-system involvement	.23	.14	2.51	1	.11	1.25	.95-1.66
C4: Aggression & behavioral problems	.15	.15	1.01	1	.32	1.16	.87-1.56
(Constant)	-.54	.15	13.58	1	.00**	.59	

Note. -2LL(*df*) = 301.06(4)**, Nagelkerke R^2 = .33, **p <.01

A second logistic regression was performed to ascertain the effects of each component from the PCA on the likelihood that participants are prescribed ADHD/stimulant medications (see Table 12). The model was statistically significant and accounted for 15% (Nagelkerke R^2) of the variance. Component 1: Psychiatric concerns and Component 3: Justice-system involvement were significant predictors, such that increasing scores on such components were associated with an increased likelihood of being prescribed ADHD/stimulant medications.

Table 12

Regression Analysis Summary for PCA Components Predicting ADHD/Stimulant Medications (n = 283)

Variable	*B*	*SE*	*Wald*	*df*	*p*	Exp(*B*)	95% CI for EXP(*B*)
C1: Psychiatric concerns	.55	.14	16.06	1	.00**	1.73	1.32-2.26
C2: ACEs	.25	.14	3.41	1	.07	1.29	.99-1.68
C3: Justice-system involvement	.28	.13	4.32	1	.04*	1.32	1.02-1.71
C4: Aggression & behavioral problems	.07	.14	.24	1	.62	1.07	.82-1.39
(Constant)	-.51	.13	15.23	1	.00**	.60	

Note. -2LL(*df*) = 344.81(4)**, Nagelkerke R^2 = .15, *p < .05, **p < .01

Research Aim 3

Hypothesis 3a: Participants will exhibit greater degrees of psychotropic polypharmacy after admission to the treatment facility, such that they are more likely to have medications added than subtracted. The frequencies in values of the change variable calculated are listed in Table 13, and a histogram of this data is provided in Figure 2. Although 37.8% (n = 105) of participants did not experience a change in the number of medication classes prescribed following admission to the treatment facility, 38.9% (n = 108) experienced an increase and 23.5% (n = 65) experienced a decrease. Few participants experienced a large change in the number of classes prescribed after admission, with most participants falling in the -2 to +3 range.

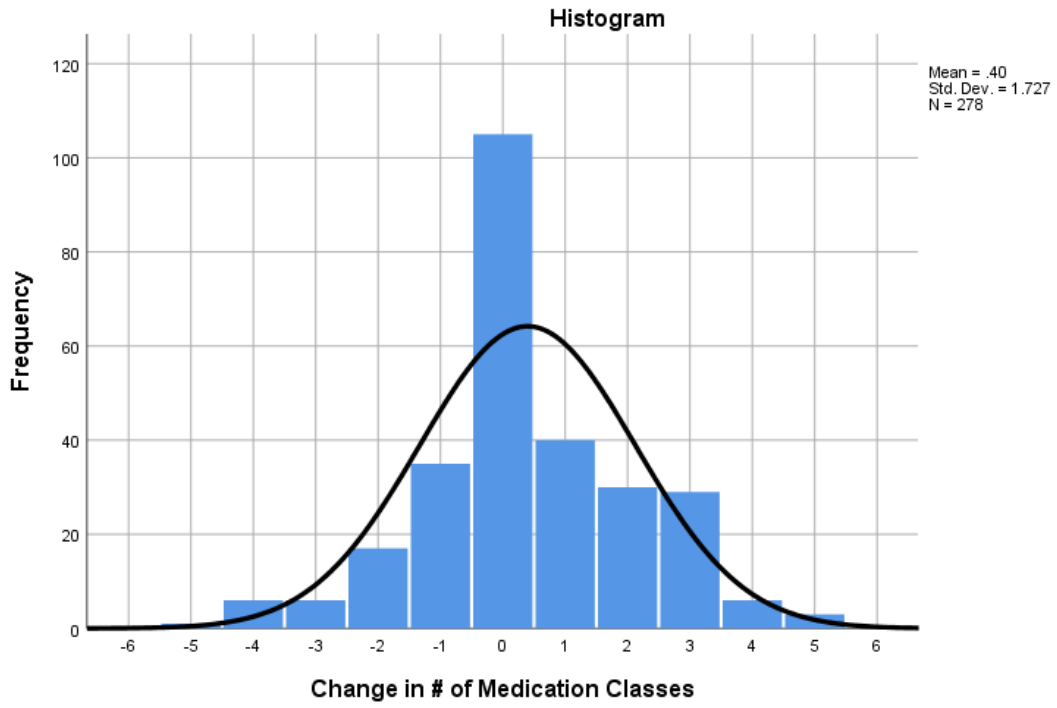
Table 13

Frequencies of Variable Representing Change in Number of Medication Classes Prescribed After Admission to Treatment Facility (n = 278)

	Frequency	Percent
-5	1	.4
-4	6	2.2
-3	6	2.2
-2	17	6.1
-1	35	12.6
0	105	37.8
1	40	14.4
2	30	10.8
3	29	10.4
4	6	2.2
5	3	1.1
Total	278	100.0

Figure 2

Histogram Representing the Change in Number of Medication Classes After Admission to the Treatment Facility



Hypothesis 3b: Differences in polypharmacy, whether positive or negative, will be examined based on significant predictor indices of polypharmacy determined in earlier analyses. Two regressions were conducted with the change variable as the dependent variable: one with number of diagnoses as the independent variable, and one with the PCA components as independent variables (see Tables 14 & 15). Neither model was significant, and neither produced significant predictors.

Table 14

Regression Analysis Summary for Number of Diagnoses Predicting Change in Medication Classes Post-Admission (n = 278)

Variable	*B*	*SE B*	β	*t*	*p*
(Intercept)	.49	.19		2.53	.01*
Number of diagnoses	-.02	.04	-.03	-.56	.57

Note. R^2 = .00, *F*=.32, *p < .05

Table 15

Regression Analysis Summary for PCA Components Predicting Change in Medication Classes Post-Admission (n = 278)

Variable	*B*	*SE B*	β	*t*	*p*
(Intercept)	.40	.10		3.82	.00**
C1: Psychiatric concerns	-.09	.12	-.05	-.86	.39
C2: ACEs	.19	.11	.11	1.79	.08
C3: Justice-system involvement	-.12	.11	-.07	-1.12	.27
C4: Aggression & behavioral problems	-.07	.10	-.04	-.66	.51

Note. R^2 = .02, *F*=1.18, **p < .01

Chapter 4. Discussion

This study is the first to examine polypharmacy specific to adolescents who have engaged in sexually abusive behaviors. Though past literature suggests this population is at risk for polypharmacy given characteristics of such youth, prescribing practices may be different than for those in related groups. Additionally, this study sought to examine what factors might be most relevant to the practice of polypharmacy in this population.

Descriptive results were consistent with prior research in that the sample evidenced elevated rates of ACEs, indicators of residential instability, psychiatric concerns, and behavior problems. Previous studies have evidenced skewed distribution rates of ACEs in adolescents who have engaged in sexually abusive behaviors, with few youth experiencing low numbers of ACEs and the majority of youth experiencing four or more ACEs (Barra et al., 2017; Hall et al., 2017). Results indicate our sample not only evidences high rates of overt abuse (e.g., 61% of youth were sexually abused, and 51% were physically abused), but also household dysfunction. Over 80% of participants experienced parental separation/divorce, and prevalence of other indicators of household dysfunction were in excess of 40%. The high prevalence of ACEs in this sample is likely associated with DCS involvement and movement to various residential placements. High numbers of out-of-home placements and multiple schools in the current sample illustrate the level of inconsistency and uncertainty in these adolescents' lives. Each movement also represents a possible disruption in medical or psychological care, contributing to the risk of polypharmacy.

Also consistent with past literature involving justice-involved youth is the high rate of comorbid psychiatric diagnoses, as well as more serious psychiatric concerns such as suicidality and self-harm (Fazel et al., 2011; Ogloff et al., 2015). Notably, the rate of previous suicide

attempts for this sample is 23%, which is more than double the estimated rates for adolescents in the community, which typically range from 5-10% (Kann et al., 2014). A higher level of acuity and severity is indicated for such concerns, which puts individuals at further risk for polypharmacy (Brenner et al., 2014; Fontanella et al., 2009). Behavior problems were also common, which is notable as these issues are often treated pharmacologically, especially with medications with more severe side effects (e.g., antipsychotics and stimulants; Blader, 2006; Ninan et al., 2014). Overall, descriptive findings corroborate that the current sample is a subset of different groups at higher risk for polypharmacy.

General Trends in Prescribing

Many participants began taking psychotropic medications at a young age, with some being prescribed such medications as infants. Notably, 17% of participants (inclusive of those for whom no medication was prescribed or who had missing data; otherwise, 44% of those for whom medications were used) initiated psychotropic medications at or before age six, which is the age range that researchers caution against prescribing for given the risks for altering child development and possible chronic use of such medications (Crismon & Argo, 2009). Almost 20% of the current sample falling in this category is concerning, as there are high risks of lasting impacts on neurodevelopment and concerns of ADRs for individuals this young. These children are less able, or not able at all, to communicate about ADRs or general mood while on such medications. This finding clearly illustrates that prescribing decisions do not always follow published guidelines, which should be of public concern.

The current findings confirmed suspected high rates of polypharmacy in this sample. Over 67% of the sample were prescribed medications from two or more classes. Antidepressants and anti-anxiety medications were the most commonly prescribed classes, but classes known for

more extreme ADRs were not uncommon. The high prevalence of antipsychotics (38% overall) is concerning, especially considering that few participants (6.1%) were diagnosed with a psychotic disorder. This high rate of antipsychotic prescription is consistent with other research suggesting that antipsychotics are often prescribed off-label to individuals with behavior problems (Pringsheim, Panagiotopoulos et al., 2011), as most participants evidenced aggression and behavioral issues in various settings. Specific diagnostic categories with high prevalence of antipsychotics included ODD and CD (>50%), as well as IAC disorders and trauma-related disorders (<60%). This may be related to behavioral issues as well, given that those with IAC disorders often evidence irritability, difficulty with communication, and low frustration tolerance, all of which could present as externalizing problems. Research investigating off-label prescribing of antipsychotics denotes rising use among youth with autism spectrum disorders to treat such behaviors (Pringsheim, Panagiotopoulos et al., 2011; Malone et al., 2007). Additionally, symptoms of post-traumatic stress may be misinterpreted as inattention or hyperactivity (Hodas, 2006).

Given that antipsychotics often cause sedating and deactivating side effects in children, an ethical question arises as to how and why these medications are beneficial to the presenting problem of behavioral issues. The associated deactivation provides a rapid treatment alternative to address behavior issues in comparison to behavioral therapies, which may take more time and effort to implement. However, psychosocial and behavioral therapies remain the frontline treatment for aggression and behavior management. It is suggested that these therapies be implemented continuously even if medications are introduced, as the former have robust empirical evidence for long-term outcomes and can also address other areas of the youth's life, such as caregiver attachment and communication (Magalotti et al., 2019). Because antipsychotic

medications are known for potentially severe metabolic and neurological ADRs, extreme caution should be utilized when prescribed to youth, and sufficient monitoring for ADRs is necessary (Pringsheim, Doja et al., 2011). Psychosocial therapies may be more ethically appropriate for treating these issues, with pharmalogical interventions utilized temporarily when necessary.

The prevalence rate of medications for side effects was surprisingly low (i.e., 4.7% overall) given the degree of polypharmacy and high prevalence of antipsychotics in this sample. However, this could represent differences in dosing, physical health, and response to medication in younger people as opposed to psychiatric adult populations, where medications for side effects are much more common (Stroup & Gray, 2018). The low rate in this sample could perhaps be viewed as positive, as concomitant medications, though sometimes necessary, are typically considered undesirable unless other management strategies have failed (Stroup & Gray, 2018).

The current study did reveal a positive association between cumulative diagnoses and number of medication classes prescribed, though this was not true for age of initiation of psychotropic medications. These results support the strong link between comorbidity and polypharmacy evidenced in other studies (e.g., Comer et al., 2010; Duffy et al., 2005). Demographic factors did not significantly impact polypharmacy practices, except that antidepressants were more common for White participants. Diagnostic categories with the highest averages of medication classes were psychotic spectrum disorders, trauma-related disorders, and IAC disorders, which may be illustrative of diagnoses with more acuity, severity, or treatment-interfering behaviors being at greater risk for polypharmacy.

Principal Component Analysis

The exploratory PCA was conducted in hopes of better understanding how these risk factors for polypharmacy may interact with one another. Past research has examined subsets of

the variables selected, though a more detailed analysis of a larger number of risk factors was conducted to determine patterns and groupings of such variables within this unique population. The analysis yielded four components that were named in accordance with the variables they include. Notably, variables that represented behavioral problems dispersed across the components, suggesting nuanced relationships with other variables within those components. Impulsivity, anger dyscontrol, age at first aggressive behavior, and out-of-home placements due to behavior problems loaded on Component 1: Psychiatric concerns, while other aggression- and behavior-related variables loaded on Component 4: Aggression & behavioral problems. This is likely due to the fact that behavior issues can be direct symptoms of psychiatric diagnoses, such as ADHD, ODD, CD, or IAC disorders. However, it is an interesting finding that similar variables grouped across differing components. Additionally, variables relating to out-of-home placements were found in both Component 1: Psychiatric concerns and Component 2: ACEs. Typically, residential placements are preceded by trauma and DCS involvement, but placements due to behavior problems and total number of placements grouped with the psychiatric variables. This could indicate that participants with more placements evidenced greater behavioral problems and psychiatric concerns. Contents of Component 1 indicate that behavioral problems are common for those with complex psychiatric needs, and such behavioral problems could initiate a transition in placements.

Though it might be assumed that youth with severe behavioral problems would be more likely to contact the criminal justice system, results from the PCA indicated that Component 3: Justice-system involvement and Component 4: Aggression & behavioral problems were not highly correlated. Thus, there may be a distinction between informal aggressive behaviors and aggression/violence that justifies formal criminal charges. This may also reflect efforts at

diversion or other mechanisms intended to redirect youth with histories of aggression and trauma from the criminal justice system. Additionally, variables associated with sexual offending grouped with Component 4: Aggression & behavioral problems rather than Component 3: Justice-system involvement; these variables also did not load onto a separate component specific to sexual behavior problems. This is notable as these variables were included in the PCA because prior literature has not indicated whether problematic sexual behaviors independently increase risk for polypharmacy. The current results suggest that sexual behavior problems may not significantly differ from general behavioral problems with regard to polypharmacy risk. However, some variables related to sexual offending were omitted from later iterations of the PCA as they did not evidence meaningfully high factor loadings. To better investigate this question, studies comparing polypharmacy practices across youth with and without sexually abusive behaviors in the same sample should be conducted.

With regard to polypharmacy outcomes, different components were significantly associated with various outcomes. Component 1: Psychiatric concerns and Component 2: ACEs were significantly associated with increasing numbers of current medication classes, as well as current antipsychotic use. Increased and more serious psychiatric symptoms perhaps suggest a more complex presentation, which may require more forms of medication to treat each presenting concern. Previous analyses indicated that antipsychotics were not used to treat solely psychotic symptoms, but rather a wide variety of behavior-related diagnoses, which are also represented within Component 1. Additionally, Component 1 included the total number of out-of-home placements and psychiatric inpatient admissions, each of which could constitute a disruption in clinical care, thus increasing risk for polypharmacy (Jokanovic et al., 2015; Medhekar et al., 2019). Component 2 measured trauma, maltreatment, dysfunction, and

indicators of residential instability. The association between Component 2 and increasing numbers of medication classes is consistent with the breadth of literature concerning systems-involved youth and risk for polypharmacy (Brenner et al., 2014; Longhofer et al., 2011).

Component 1: Psychiatric concerns and Component 3: Justice-system involvement were significantly associated with current ADHD/stimulant medications. These medications typically address impulsivity and hyperactivity, which psychiatric concerns may encompass. Impulsivity may also increase risk of delinquency, as individuals who act impulsively may not think through consequences of their actions and be more likely to recidivate. Notably, Component 4: Aggression & behavioral problems was not significantly related to ADHD/stimulant medication prescription. This is surprising since behavioral impulsivity is a feature of ADHD and would presumably lead to a relationship between the two. However, if participants have been prescribed such medications and experience effective control of their ADHD, it may lead to fewer of the behavioral problems included within Component 4.

It is also worth noting that some hypothesized models did not reach significance in ways that were unexpected. Component 4: Aggression & behavioral problems was not significantly associated with polypharmacy or any specific medication class. One possibility is that the behavior problems most relevant to prescribing practices were included within Component 1 rather than Component 4. Another consideration is the high base rates of aggression and behavioral issues in this sample. Sometimes high base rates (and thus, lack of heterogeneity) may lead to insignificant findings, as it is difficult to discriminate effects of behaviors that are frequently characteristic of the sample. That is, if the majority of or all participants evidenced aggression, such variables are not as informative for research questions that attempt to find

differences amongst subgroups. A third possibility is that the other components were simply more predictive of the dependent variables chosen.

Changes in Prescribing

Past research has found that adolescents in treatment facilities are at risk of having medications added rather than subtracted from their regimen (van Wattum et al., 2013), and this was supported in the current study. More participants experienced an increase rather than a decrease in the number of medication classes prescribed after being admitted to the treatment facility. However, the prevalence rate of participants with no cumulative change (37.8%, n = 105) was almost as high as that of participants who experienced an increase (38.9%, n = 108). Though there are positive outcomes associated with decreasing polypharmacy (van Wattum et al., 2013), especially given the increase in risk for ADRs as medications increase, sometimes polypharmacy is clinically indicated or even necessary for proper care. Further, an increase in medication classes for a patient may be a temporary solution or may suitably address a problem that has previously been less effectively managed. It is noteworthy that over one-fifth of participants (22%, n = 65) experienced a decrease in medication classes post-admission, as well as the fact that less than half of participants experienced an increase.

The current study did not find significant associations with the change in medication classes post-admission. This was unexpected given that there were significant findings for other outcomes of polypharmacy, and previous research has linked increased rates of polypharmacy to admission to treatment facilities, hospitalizations, and incarceration/justice-system involvement (Duffy et al., 2005; Griffiths et al., 2012; van Wattum et al., 2013). Other factors not explored in the current study may be predictive of such changes.

Summary & Clinical Implications

This study was the first to examine psychotropic polypharmacy in adolescents who have engaged in sexually abusive behaviors, a population that exhibits multiple vulnerabilities to such practices. Results show evidence of polypharmacy for these youth, with the majority of youth being prescribed more than one class of psychotropic medication. Additionally, many were prescribed antipsychotics for off-label purposes. Many participants initiated psychotropic medication use at young ages, which researchers and professional organizations caution against due to the risk for potential harm. Psychiatric complexity, instances of trauma and household dysfunction, and behavioral issues appeared to be most predictive of risk for polypharmacy, all of which are common amongst justice-involved youth (Fox et al., 2015; Huefner et al., 2017; Lyons et al., 2013). Results also supported previous findings that youth who have engaged in sexually abusive behaviors are particularly susceptible to trauma, mental health concerns, and residential instability.

Polypharmacy is a potential concern that can be added to the long list of vulnerabilities for youth who have engaged in sexually abusive behaviors. Their experiences are often characterized by repeated traumatic events and extreme instability, which can lead to behavior problems and psychological distress. Chronic patterns of changing medications only add to the unpredictable and chaotic nature of their lives. Especially for youth who exhibit aggression and disobedience, providing coping skills and behavioral interventions should be emphasized over the use of medications like antipsychotics that carry a range of physical and psychological risks.

Whether the treatment avenues chosen are pharmacological, psychosocial, or both, it is impossible to ignore the effects of cumulative trauma for justice-involved youth. Researchers and clinicians alike have called for a trauma-informed approach to treatment within the juvenile

justice system in which practitioners and staff working with these youth are educated and trained on the effects of trauma (Skinner-Osei et al., 2019). This includes viewing maladaptive, problematic behavior through the lens of trauma, and avoiding the repetition of disempowering dynamics in the helping relationship (Levenson, 2019). Guidelines also encourage youth and their families to play a more active role in the youth's treatment (Branson et al., 2017). These suggestions correspond to recommendations for prescribing psychotropic medications in youth (e.g., proper psychological assessment and screening, informed consent with youth and caregiver present, utilizing evidence-based practices when available).

Another way to improve treatment within the juvenile justice system is through the utilization of multidisciplinary team-based care. Calls for such collaboration are not new, as researchers have noted the potential benefits of combining agencies and professionals to streamline care for justice-involved youth (O'Hara et al., 2019; Unnithan & Johnston, 2012). Mental health professionals may work alongside court representatives, social workers, and medical prescribers to best assist these youth and minimize disruptions in care. This not only allows for psychologists to encourage trauma-informed care amongst the various agencies that contact youth, but it could also potentially decrease rates of polypharmacy by including prescribers within the team. Psychiatrists and primary care physicians often practice the most independently, and they may have less training in the impact of trauma on behavior or the effectiveness of behavioral interventions. Improving treatment for justice-involved youth could not only increase the quality of their daily lives but perhaps even prevent future revictimization or recidivism.

In conclusion, polypharmacy is an issue about which prescribers and patients alike should be concerned. Though polypharmacy may be warranted at times, there are significant risks for

ADRs when taking psychotropic medications, especially when patients are children. Adolescents who have engaged in sexually abusive behaviors are a population uniquely at risk for polypharmacy, among other vulnerabilities for detrimental outcomes. They are also commonly prescribed medications with unwanted side effects and possible ADRs, including antipsychotics. The current study suggests that psychiatric complexity, behavioral issues, and trauma/instability are all important considerations when prescribing medications to these youth. Further research regarding polypharmacy in vulnerable youth is needed to help inform clinical practice and policy.

Limitations

There are limitations in the current study that should be acknowledged. This is the first study to my knowledge that investigates polypharmacy in this specific population, so some hypotheses and results were exploratory rather than confirmatory. Additionally, other variables not included in this study may be pertinent to polypharmacy practices in this population. There are inherent limitations due to the nature of archival data collection. For example, follow-up questions or clarification of confusing data could not be asked of participants, as data were collected from archival records. Information available for each participant could be impacted by their previous placements, caregivers, or providers; this is notable given the level of residential instability of the youth in this sample. Information recorded could also be inaccurate, or it may be affected by self-report/memory bias of young participants or caregivers. Further, data were entered into the record by different people over time.

The archival data collection captured a time period of ten years during which participants entered the treatment facility, and historical records of previous medications dated back even further. Thus, this data is representative of the practices of multiple prescribers at different time

points. This could result in variations in polypharmacy practices, as each provider may have different preferences regarding medication classes, specific medications, or the practicality/risks of polypharmacy. Relatedly, prescribing trends and available medications could vary over this ten-year span. New medications or updated prescribing guidelines could affect what and how providers prescribe.

Further research specific to adolescents who have engaged in sexually abusive behaviors is needed, as these results represent a single sample from a distinct geographic location. The current sample was predominantly White, and only five participants were female. This limits the generalizability of results to other female adolescents or to specific non-White ethnicities given that race was collapsed into White and non-White. Another limitation is the lack of a comparison group for this sample. Inclusion of justice-involved youth without histories of sexual offending could potentially impact the PCA and outcomes regarding aggression. This would also shed light on potential differences amongst youth with and without sexually abusive behaviors with regard to prescribing practices.

Age of initiation of psychotropic medications was a polypharmacy-related outcome variable with a significant amount of missing data (44%), which greatly limited statistical power of analyses including this outcome variable. This is likely related to the limitations of archival data collection mentioned previously. The information available indicated that a proportion of participants began psychotropic medications at a very young age, but the distribution of this variable may be much more skewed in larger samples with fewer instances of missing data. Lastly, this study examined polypharmacy through the measure of medication classes rather than individual medications. Though between-class polypharmacy may pose greater risk of detrimental outcomes, different indications of polypharmacy could be measured if changes of

medication within the same class were included. Regardless of measurement, future studies should be explicit in the definition of polypharmacy utilized, including designations of within-class or between-class.

Conclusion

This study examined psychotropic polypharmacy practices within a sample of adolescents who have engaged in sexually abusive behaviors, a unique population at risk for a variety of detrimental outcomes. Polypharmacy was common in the sample, with many participants being prescribed medications associated with high risk for ADRs (i.e., antipsychotics), oftentimes for off-label use. A surprising number of individuals began taking psychotropic medications at a very young age, increasing their risk for neurodevelopmental problems and chronic use of such medications. Some differences were evident amongst different diagnostic categories, though general trends indicated that youth with diagnoses associated with behavioral problems were highly medicated. PCA results revealed groupings of predictor variables associated with past literature. Some components were significantly associated with polypharmacy outcomes, while other hypotheses yielded insignificant results. Importantly, this is the first study of its kind to examine such practices in this niche population. Study findings present unique considerations for treatment and policies regarding justice-involved youth, as well as general psychotropic prescribing practices in pediatric populations.

References

American Academy of Child and Adolescent Psychiatry. (2012, February). A guide for public child serving agencies on psychotropic medications for children and adolescents. Retrieved October 13, 2020, from https://www.aacap.org/App_Themes/AACAP/docs/press/guide_for_community_child_serving_agencies_on_psychotropic_medications_for_children_and_adolescents_2012.pdf

Anda, R. F., Brown, D. W., Felitti, V. J., Bremner, J. D., Dube, S. R., & Giles, W. H. (2007). Adverse childhood experiences and prescribed psychotropic medications in adults. *American Journal of Preventive Medicine*, *32*(5), 389–394. https://doi.org/10.1016/j.amepre.2007.01.005

Barra, S., Bessler, C., Landolt, M. A., & Aebi, M. (2017). Patterns of adverse childhood experiences in juveniles who sexually offended. *Sexual Abuse: A Journal of Research and Treatment*, 107906321769713. https://doi.org/10.1177/1079063217697135

Björkenstam, C., Björkenstam, E., Ljung, R., Vinnerljung, B., & Tuvblad, C. (2013). Suicidal behavior among delinquent former child welfare clients. *European Child & Adolescent Psychiatry*, *22*(6), 349–355. https://doi.org/10.1007/s00787-012-0372-8

Blader J. C. (2006). Pharmacotherapy and postdischarge outcomes of child inpatients admitted for aggressive behavior. *Journal of Clinical Psychopharmacology*, *26*(4), 419–425. https://doi.org/10.1097/01.jcp.0000227356.31203.8a

Bourgeois, F. T., Shannon, M. W., Valim, C., & Mandl, K. D. (2010). Adverse drug events in the outpatient setting: An 11-year national analysis. *Pharmacoepidemiology and Drug Safety*, *19*(9), 901–910. https://doi.org/10.1002/pds.1984

Branson, C. E., Baetz, C. L., Horwitz, S. M., & Hoagwood, K. E. (2017). Trauma-informed juvenile justice systems: A systematic review of definitions and core components. *Psychological trauma: Theory, research, practice & policy*, *9*(6), 635–646. https://doi.org/10.1037/tra0000255

Brenner, S. L., Southerland, D. G., Burns, B. J., Wagner, H. R., & Farmer, E. M. Z. (2014). Use of psychotropic medications among youth in treatment foster care. *Journal of Child and Family Studies*, *23*(4), 666–674. https://doi.org/10.1007/s10826-013-9882-3

Budnitz, D. S., Pollock, D. A., Weidenbach, K. N., Mendelsohn, A. B., Schroeder, T. J., & Annest, J. L. (2006). National surveillance of emergency department visits for outpatient adverse drug events. *JAMA, 296*(15), 1858-66.

Carliner, H., Gary, D., McLaughlin, K. A., & Keyes, K. M. (2017). Trauma exposure and externalizing disorders in adolescents: Results from the National Comorbidity Survey Adolescent Supplement. *Journal of the American Academy of Child & Adolescent Psychiatry*, *56*(9), 755-764.e3. https://doi.org/10.1016/j.jaac.2017.06.006

Carnahan, R. M., Lund, B. C., Perry, P. J., & Chrischilles, E. A. (2006). Increased risk of extrapyramidal side-effect treatment associated with atypical antipsychotic polytherapy. *Acta Psychiatrica Scandinavica*, *113*(2), 135–141. https://doi.org/10.1111/j.1600-0447.2005.00589.x

Chen, H., Patel, A., Sherer, J., & Aparasu, R. (2011). The definition and prevalence of pediatric psychotropic polypharmacy. *Psychiatric Services*, *62*(12), 1450–1455. https://doi.org/10.1176/appi.ps.000642011

Comer, J. S., Olfson, M., & Mojtabai, R. (2010). National trends in child and adolescent psychotropic polypharmacy in office-based practice, 1996-2007. *Journal of the American*

Academy of Child & Adolescent Psychiatry, *49*(10), 1001–1010. https://doi.org/10.1016/j.jaac.2010.07.007

Correll, C. U., & Carlson, H. E. (2006). Endocrine and metabolic adverse effects of psychotropic medications in children and adolescents. *Journal of the American Academy of Child & Adolescent Psychiatry*, *45*(7), 771–791. https://doi.org/10.1097/01.chi.0000220851.94392.30

D'Souza, R.S., & Hooten, W. M. (2020). Extrapyramidal symptoms (EPS) [Updated 2020 Aug 23]. In *StatPearls [Internet]*. StatPearls Publishing. Available from: https://www.ncbi.nlm.nih.gov/books/NBK534115/

Dean, A. J., McDermott, B. M., & Marshall, R. T. (2006). Psychotropic medication utilization in a child and adolescent mental health service. *Journal of child and adolescent psychopharmacology*, *16*(3), 273–285. https://doi.org/10.1089/cap.2006.16.273

Dharni, A., & Coates, D. (2018). Psychotropic medication profile in a community youth mental health service in Australia. *Children & Youth Services Review*, *90*, 8–14. https://doi.org/10.1016/j.childyouth.2018.05.007

Distefano, C., Zhu, M., & Mindrila, D. (2008). Understanding and using factor scores: Considerations for the applied researcher. *Practical Assessment, Research, & Evaluation, 14*, 20. https://doi.org/10.7275/da8t-4g52

Divac, N., Prostran, M., Jakovcevski, I., & Cerovac, N. (2014). Second-generation antipsychotics and extrapyramidal adverse effects. *Biomed Res Int, 2014*(656370). doi: 10.1155/2014/656370.

dosReis, S., Tai, M., Goffman, D., Lynch, S. E., Reeves, G., & Shaw, T. (2014). Age-related trends in psychotropic medication use among very young children in foster care. *Psychiatric Services*, *65*(12), 1452–1457. https://doi.org/10.1176/appi.ps.201300353

Duffy, F. F., Narrow, W. E., Rae, D. S., West, J. C., Zarin, D. A., Rubio-Stipec, M., Pincus, H. A., & Regier, D. A. (2005). Concomitant pharmacotherapy among youths treated in routine psychiatric practice. *Journal of Child and Adolescent Psychopharmacology*, *15*(1), 12–25. https://doi.org/10.1089/cap.2005.15.12

Fazel, S., Grann, M., Kling, B., & Hawton, K. (2011). Prison suicide in 12 countries: an ecological study of 861 suicides during 2003-2007. *Social psychiatry and psychiatric epidemiology*, *46*(3), 191–195. https://doi.org/10.1007/s00127-010-0184-4

Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., Koss, M. P., & 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

Fox, B. H., Perez, N., Cass, E., Baglivio, M. T., & Epps, N. (2015). Trauma changes everything: Examining the relationship between adverse childhood experiences and serious, violent, and chronic juvenile offenders. *Child Abuse and Neglect, 46*, 163-173.

Garcia-Delgar, B., Morer, A., Varela, E., Romero, S., García, M., Coffey, B. J., & Lázaro, L. (2018). Activation in children and adolescents treated with selective serotonin reuptake inhibitors: A weighty reason? *Journal of Clinical Psychopharmacology*, *38*(5), 475–480. https://doi.org/10.1097/JCP.0000000000000923

Ghaemi, S. N. (2002). *Polypharmacy in psychiatry*. Marcel Dekker.

Gnjidic, D., Tinetti, M., & Allore, H. G. (2017). Assessing medication burden and polypharmacy: Finding the perfect measure. *Expert Review of Clinical Pharmacology, 10*(4), 345–347. doi: 10.1080/17512433.2017.1301206

Goldberg, S. G., & Wagner, K. (2019). American Psychological Association practice guidelines for psychopharmacology: Ethical practice considerations for psychologists involving psychotropic use with children and adolescents. *Journal of Clinical Psychology*, *75*(3), 344–363. https://doi.org/10.1002/jclp.22705

Gómez, C., Vega-Quiroga, S., Bermejo-Pareja, F., Medrano, M. J., Louis, E. D., & Benito-León, J. (2014). Polypharmacy in the elderly: A marker of increased risk of mortality in a population-based prospective study (NEDICES). *Gerontology*, *61*(4), 301–309. https://doi.org/10.1159/000365328

Griffiths, E. V., Willis, J., & Spark, M. J. (2012). A systematic review of psychotropic drug prescribing for prisoners. *Australian & New Zealand Journal of Psychiatry*, *46*(5), 407–421. https://doi.org/10.1177/0004867411433893

Gringras, P., & McNicholas, F. (1999). Developing rational protocols for paediatric psychopharmacological prescribing. *Child: Care, Health and Development*, *25*(3), 223–233. https://doi.org/10.1046/j.1365-2214.1999.00108.x

Gu, Q., Dillon, C. F., & Burt, V. L. (2010). Prescription drug use continues to increase: U.S. prescription drug data for 2007-2008. *NCHS data brief*, (42), 1–8. Retrieved from https://www.cdc.gov/nchs/data/databriefs/db42.pdf

Guthrie, B., Makubate, B., Hernandez-Santiago, V., & Dreischulte, T. (2015). The rising tide of polypharmacy and drug-drug interactions: Population database analysis 1995–2010. *BMC Medicine, 13*, 74. doi: 10.1186/s12916-015-0322-

Haider, S. I., Johnell, K., Thorslund, M., & Fastbom, J. (2007). Trends in polypharmacy and potential drug-drug interactions across educational groups in elderly patients in Sweden for the period 1992 - 2002. *Int J Clin Pharmacol Therapy, 45*(12):643-53. doi: 10.5414/cpp45643.

Hall, K. L., Stinson, J. D., & Moser, M. R. (2017). Impact of childhood adversity and out-of-home placement for male adolescents who have engaged in sexually abusive behaviors. *Child Maltreatment, 23*(1), 63-73. https://doi.org/10.1177/1077559517720726

Hodas, G. R. (2006). *Responding to childhood trauma: The promise and practice of trauma informed care.* Harrisburg, PA: Pennsylvania Office of Mental Health and Substance Abuse Services.

Huefner, J. C., Smith, G. L., Ringle, J. L., Stevens, A. L., Mason, W. A., & Parra, G. R. (2017). Patterns of psychotropic medication at admission for youth in residential care. *Journal of Child and Family Studies*, *26*(1), 317–328. https://doi.org/10.1007/s10826-016-0548-9

Inauen, J., Bierbauer, W., Lüscher, J., König, C., Tobias, R., Ihle, A., Zimmerli, L., Holzer, B. M., Battegay, E., Siebenhüner, K., Kliegel, M., & Scholz, U. (2017). Assessing adherence to multiple medications and in daily life among patients with multimorbidity. *Psychology & Health*, *32*(10), 1233–1248. https://doi.org/10.1080/08870446.2016.1275632

Janno, S., Holi, M., Tuisku, K., & Wahlbeck, K. (2004). Prevalence of neuroleptic-induced movement disorders in chronic schizophrenia inpatients. *Am J Psychiatry, 161*(1), 160-3. doi:10.1176/appi.ajp.161.1.160

Jensen, P. S., Vitiello, B., Leonard, H., & Laughren, T. P. (1994). Design and methodology issues for clinical treatment trials in children and adolescents. Child and adolescent

psychopharmacology: Expanding the research base. *Psychopharmacology Bulletin*, *30*(1), 3–8.

Jerrell, J. M. (2010). Neuroendocrine-related adverse events associated with antidepressant treatment in children and adolescents. *CNS Neuroscience & Therapeutics*, *16*(2), 83–90. https://doi.org/10.1111/j.1755-5949.2009.00106.x

John, S. G., Brandt, T. W., Secrist, M. E., Mesman, G. R., Sigel, B. A., & Kramer, T. L. (2019). Empirically-guided assessment of complex trauma for children in foster care: A focus on appropriate diagnosis of attachment concerns. *Psychological Services*, *16*(1), 120–133. https://doi.org/10.1037/ser0000263

Jokanovic, N., Tan, E. C. K., Dooley, M. J., Kirkpatrick, C. M., & Bell, J. S. (2015). Prevalence and factors associated with polypharmacy in long-term care facilities: A aystematic review. *Journal of the American Medical Directors Association*, *16*(6), 535.e1-535.e12. https://doi.org/10.1016/j.jamda.2015.03.003

Kahn, J. H. (2006). Factor analysis in counseling psychology research, training, and practice: Principles, advances, and applications. *Counseling Psychologist, 34*(5), 684-718. https://doi.org/10.1177/0011000006286347

Kang, T., Wood, J. M., Eno Louden, J., & Ricks, E. P. (2018). Prevalence of internalizing, externalizing, and psychotic disorders among low-risk juvenile offenders. *Psychological Services*, *15*(1), 78–86. https://doi.org/10.1037/ser0000152

Kann, L., Kinchen, S., Shanklin, S., Flint, K., Hawkins, J., Harris, W., . . . Zaza, S. (2014). Youth risk behavior surveillance — United States, 2013. *Morbidity and Mortality Weekly Report: Surveillance Summaries, 63*(4), 1-168. Retrieved May 17, 2021, from http://www.jstor.org/stable/24806229

Khalil, H., & Huang, C. (2020). Adverse drug reactions in primary care: A scoping review. *BMC Health Serv Res, 20*(5). https://doi.org/10.1186/s12913-019-4651-7

Koskenvuo, K., & Koskenvuo, M. (2015). Childhood adversities predict strongly the use of psychotropic drugs in adulthood: A population-based cohort study of 24 284 Finns. *Journal of Epidemiology and Community Health*, *69*(4), 354–360. https://doi.org/10.1136/jech-2014-204732

Kukreja, S., Kalra, G., Shah, N., & Shrivastava, A. (2013). Polypharmacy in psychiatry: A review. *Mens Sana Monographs, 11*(1), 82–99. doi:10.4103/0973-1229.104497

Lazarou, J., Pomeranz, B. H., & Corey, P. N. (1998). Incidence of adverse drug reactions in hospitalized patients: a meta-analysis of prospective studies. *Journal of the American Medical Association, 279*(15), 1200–1205. doi:10.1001/jama.279.15.1200

Lee, C. S., Williamson, L. R., Martin, S. E., DeMarco, M., Majczak, M., Martini, J., Hunter, H. L., Fritz, G., & Boekamp, J. (2015). Adverse events in very young children prescribed psychotropic medications: Preliminary findings from an acute clinical sample. *Journal of Child and Adolescent Psychopharmacology*, *25*(6), 509–513. https://doi.org/10.1089/cap.2015.0034

Levenson, J. S. (2019). Trauma-informed practices with youth in criminal justice settings. In P. Ugwudike, H. Graham, F. McNeill, P. Raynor, F.S., Taxman, & C. Trotter (Eds.). *The Routledge Companion to Rehabilitative Work in Criminal Justice*. United Kingdom: Routledge.

Lieberman, J. A. (2004). Managing anticholinergic side effects. *Primary Care Companion to The Journal of Clinical Psychiatry, 6*(suppl 2), 20–23.

Logan-Greene, P., Tennyson, R. L., Nurius, P. S., & Borja, S. (2017). Adverse childhood experiences, coping resources, and mental health problems among court-involved youth. *Child & Youth Care Forum*, *46*(6), 923–946. https://doi.org/10.1007/s10566-017-9413-2

Longhofer, J., Floersch, J., & Okpych, N. (2011). Foster youth and psychotropic treatment: Where next? *Children and Youth Services Review*, *33*(2), 395–404. https://doi.org/10.1016/j.childyouth.2010.10.006

Luft, M. J., Lamy, M., DelBello, M. P., McNamara, R. K., & Strawn, J. R. (2018). Antidepressant-induced activation in children and adolescents: Risk, recognition and management. *Current Problems in Pediatric and Adolescent Health Care*, *48*(2), 50–62. https://doi.org/10.1016/j.cppeds.2017.12.001

Lyons, C. L., Wasserman, G. A., Olfson, M., McReynolds, L. S., Musabegovic, H., & Keating, J. M. (2013). Psychotropic medication patterns among youth in juvenile justice. *Administration and Policy in Mental Health & Mental Health Services Research*, *40*(2), 58–68. https://doi.org/10.1007/s10488-011-0378-4

Magalotti, S. R., Neudecker, M., Zaraa, S. G., & McVoy, M. K. (2019). Understanding chronic aggression and its treatment in children and adolescents. *Current Psychiatry Reports*, *21*(12), 123. https://doi.org/10.1007/s11920-019-1105-1

Malone, R. P., Delaney, M. A., Hyman, S. B., and Cater, J. R. (2007). Ziprasidone in adolescents with autism: An open-label pilot study. *Journal of Child and Adolescent Psychopharmacology, 17*(6), 779-790. http://doi.org/10.1089/cap.2006.0126

Malone, R. P., Sheikh, R., & Zito, J. M. (1999). Psychopharmacology: Novel antipsychotic medications in the treatment of children and adolescents. *Psychiatric Services*, *50*(2), 171–174. https://doi.org/10.1176/ps.50.2.171

Mansur, N., Weiss, A., & Beloosesky, Y. (2008). Relationship of in-hospital medication modifications of elderly patients to post discharge medications, adherence, and mortality. *Ann Pharmacother 42*, 783-9. doi:10.1345/aph.lL070

Markotic, F., Obrdalj, E. C., Zalihic, A., Pehar, R., Hadziosmanovic, Z., Pivic, G., Durasovic, S., Grgic, V., Banozic, A., Sapunar, D., & Puljak, L. (2013). Adherence to pharmacological treatment of chronic nonmalignant pain in individuals aged 65 and older. *Pain Medicine*, *14*(2), 247–256. https://doi.org/10.1111/pme.12035

McIntyre, R. S., & Jerrell, J. M. (2009). Polypharmacy in children and adolescents treated for major depressive disorder: A claims database study. *The Journal of Clinical Psychiatry*, *70*(2), 240–246. https://doi.org/10.4088/jcp.08m04212

McNally, P., McNicholas, F., & Oslizlok, P. (2007). The QT interval and psychotropic medications in children: Recommendations for clinicians. *European Child & Adolescent Psychiatry*, *16*(1), 33–47. https://doi.org/10.1007/s00787-006-0573-0

Medhekar, R., Aparasu, R., Bhatara, V., Johnson, M., Alonzo, J., Schwarzwald, H., & Chen, H. (2019). Risk factors of psychotropic polypharmacy in the treatment of children and adolescents with psychiatric disorders. *Research in Social and Administrative Pharmacy*, *15*(4), 395–403. https://doi.org/10.1016/j.sapharm.2018.06.005

Millan, M. J. (2014). On 'polypharmacy' and multi-target agents, complementary strategies for improving the treatment of depression: A comparative appraisal. *International Journal of Neuropsychopharmacology, 17*, 1009-1037. doi:10.1017/S1461145712001496

Möller, H. J., Seemuller, F., Schennach-Wolff, R., Stubner, S., Ruther, E., & Grohmann, R. (2014). History, background, concepts and current use of comedication and

polypharmacy in psychiatry. *International Journal of Neuropsychopharmacology, 17,* 983-996. doi:10.1017/S1461145713000837

Mojtabai, R., & Olfson, M. (2008). National trends in psychotherapy by office-based psychiatrists. *Arch Gen Psychiatry, 65*(8), 962–970. doi:10.1001/archpsyc.65.8.962

Ogloff, J. R. P., Talevski, D., Lemphers, A., Wood, M., & Simmons, M. (2015). Co-occurring mental illness, substance use disorders, and antisocial personality disorder among clients of forensic mental health services. *Psychiatric Rehabilitation Journal*, *38*(1), 16–23. https://doi.org/10.1037/prj0000088

O'Hara, K. L., Duchschere, J. E., Shanholtz, C. E., Reznik, S. J., Beck, C. J., & Lawrence, E. (2019). Multidisciplinary partnership: Targeting aggression and mental health problems of adolescents in detention. *The American Psychologist*, *74*(3), 329–342. https://doi.org/10.1037/amp0000439

Olfson, M. (2015). Surveillance of adverse psychiatric medication events. *JAMA, 313*(12), 1256–1257. doi:10.1001/jama.2014.15743

Olfson, M., Marcus, S. C., Weissman, M. M., & Jensen, P. S. (2002). National trends in the use of psychotropic medications by children. *Journal of the American Academy of Child & Adolescent Psychiatry*, *41*(5), 514–521. https://doi.org/10.1097/00004583-200205000-00008

Peters, T. E., & Connolly, S. (2012). Psychopharmacologic treatment for pediatric anxiety disorders. *Child and Adolescent Psychiatric Clinics of North America*, *21*(4), 789–806. https://doi.org/10.1016/j.chc.2012.07.007

Preskorn, S. H. & Lacey, R. L. (2007). Polypharmacy: When is it rational*? Journal of Psychiatric Practice, 13*(2), 97-105. doi:10.1097/01.pra.0000265766.25495.3b

Pringsheim, T., Doja, A., Belanger, S., & Patten, S. (2011). Treatment recommendations for extrapyramidal side effects associated with second-generation antipsychotic use in children and youth. *Paediatrics & Child Health*, *16*(9), 590–598.

Pringsheim, T., Panagiotopoulos, C., Davidson, J., & Ho, J. (2011). Evidence-Based Recommendations for monitoring safety of second generation antipsychotics in children and youth. *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, *20*(3), 218–233.

Qato, D. M., Wilder, J., Schumm, L. P., Gillet, V., & Alexander, G. C. (2016). Changes in prescription and over-the-counter medication and dietary supplement use among older adults in the United States, 2005 vs 2011. *JAMA Intern Med, 176*(4), 473-82. doi:10.1001/jamainternmed.2015.8581

Rambhade, S., Chakarborty, A., Shrivastava, A., Patil, U. K., & Rambhade, A. (2012). A survey on polypharmacy and use of inappropriate medications. *Toxicology International, 19*(1), 68-73. doi:10/4103/0971-6580.94506

Resnik, A. G. (2008). The human sexual response cycle: Psychotropic side effects and treatment strategies. *Psychiatric Annals*, *38*(4), 267–280. https://doi.org/10.3928/00485713-20080401-07

Rhee, T. G., & Rosenheck, R. A. (2019). Psychotropic polypharmacy reconsidered: Between-class polypharmacy in the context of multimorbidity in the treatment of depressive disorders. *Journal of Affective Disorders*, 8. doi:10.1016/j.jad.2019.04.018

Roberts, R., Rodriguez, W., Murphy, D., & Crescenzi, T. (2003). Pediatric drug labeling: Improving the safety and efficacy of pediatric therapies. *JAMA*, *290*(7), 905–911. https://doi.org/10.1001/jama.290.7.905

Skinner-Osei, P., Mangan, L., Liggett, M., & Levenson, J. S. (2019). Justice-involved youth and trauma-informed interventions. *Justice Policy Journal, 16*(2), 1-25.

Stroup, T. S., & Gray, N. (2018). Management of common adverse effects of antipsychotic medications. *World Psychiatry: Official journal of the World Psychiatric Association (WPA)*, *17*(3), 341–356. https://doi.org/10.1002/wps.20567

Unnithan, N. P., & Johnston, J. (2012). Collaboration in juvenile justice: A multi-agency study. *Federal Probation, 76*(3), 22-30.

van Wattum, P. J., Fabius, C., Roos, C., Smith, C., & Johnson, T. (2013). Polypharmacy reduction in youth in a residential treatment center leads to positive treatment outcomes and significant cost savings. *Journal of Child and Adolescent Psychopharmacology*, *23*(9), 620–627. https://doi.org/10.1089/cap.2013.0014

Varese, F., Smeets, F., Drukker, M., Lieverse, R., Lataster, T., Viechtbauer, W., … Bentall, R. P. (2012). Childhood adversities increase the risk of psychosis: A meta-analysis of patient-control, prospective- and cross-sectional cohort studies. *Schizophrenia Bulletin, 38*, 661–71.

Viktil, K. K., Blix, H. S., Moger, T. A., & Reikvam, A. (2007). Polypharmacy as commonly defined is an indicator of limited value in the assessment of drug-related problems. *British Journal of Clinical Pharmacology, 63*(2), 187–195. doi: 10.1111/j.1365-2125.2006.02744.x

Whitfield, C. L., Dube, S. R., Felitti, V. J., & Anda, R. F. (2005). Adverse childhood experiences and hallucinations. *Child Abuse & Neglect, 29*, 797-810. doi: 10.1016/j.chiabu.2005.01.004

Zito, J., Safer, D., Sai, D., Gardner, J., Thomas, D., Coombes, P., Dubowski, M., & Mendez-Lewis, M. (2008). Psychotropic medication patterns among youth in foster care. *Pediatrics, 121(1*), e157–e163. https://doi.org/10.1542/peds.2007-0212

VITA

REBECCA GILLEY

Education:	Ph.D. Psychology, East Tennessee State University, Johnson City, Tennessee, 2022
	M.A. Psychology, East Tennessee State University, Johnson City, Tennessee, 2019
	B.S. Psychology, West Virginia University, Morgantown, West Virginia, 2017
Professional Experience:	Clinical Externship, Cherokee Health Systems, Morristown, Tennessee, 2020-2021
	Clinical Externship, Alternative Community Correction Program through First Tennessee Human Resource Agency, Johnson City, Tennessee, 2019-2020
	Practicum, East Tennessee State University Behavioral Health and Wellness Clinic, Johnson City, Tennessee, 2019-2020
Teaching Experience:	Teaching Assistant, Department of Psychology, East Tennessee State University, 2017
Professional Affiliations:	Member, Association for the Treatment of Sexual Abuse (ATSA), 2019-present
	Member, Southeast Psychological Association (SEPA), 2018-2020