AN EXPLORATION OF PSYCHOTROPIC TREATMENT OF YOUTH DIAGNOSED WITH SERIOUS EMOTIONAL DISTURBANCE WITHIN WRAPAROUND SERVICE DELIVERY

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ABSTRACT

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Psychotropic medications are often a component of the care that vulnerable youth, such as those diagnosed with serious emotional disturbance (SED), receive when involved in wraparound services provided by state agencies (Harper et al., 2014). There is evidence that vulnerable youth receive (a) high rates of psychotropic medications with potentially serious side-effects, such as antipsychotics and antidepressants, and (b) high rates of polypharmacy and multi-class prescriptions leading some to question the overmedication and cost-benefit considerations associated with this practice within these populations (McMillen, Fedoravicius, Rowe, Zima, & Ware, 2007). Yet, no published studies to date have examined psychotropic medication practices within wraparound services. Using data from an ongoing statewide wraparound evaluation project, the current study examined the psychopharmacological treatment of a racially diverse group of youth diagnosed with SED (N=422) ages 7-18 receiving wraparound services. Results indicate a greater percentage of youth receiving wraparound were prescribed psychotropic medications (56% vs. 35-40%) and had higher rates of multi-class treatments (61% vs. 22-45%) than is reported in the literature for similar groups (Sullivan & Sadeh, 2015; Zito et al., 2008). Use of generalized linear mixed models indicated that there were no statistically significant reductions in the overall number of psychotropic medications taken by youth in wraparound, rates of prescription practices (i.e., monotherapy, polypharmacy, multi-class treatments) or individual class treatments. Gender, age, foster status and the nature of the community-based setting (urban or rural) did not influence changes in the overall number of medications, rates of

prescription practices, or medications within class. Youth who had reductions in the number of psychotropic medications and those who initiated medication treatment during wraparound had similar and clinically significant improvements in mental health functioning compared to other youth in wraparound. Future research on psychotropic medication practices within wraparound services is necessary.

To Mallory for all of your love and support with this and so many other adventures.

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Chapter 1: Introduction

Children and adolescents who are at an increased risk for negative mental health outcomes or other developmental challenges are considered vulnerable. Research has indicated that youth from low socio-economic status families who are in foster care and who have serious emotional disturbance (SED) are considered to be at a very elevated risk for negative outcomes (Punch, 2002). Up to 80% of youth in foster care have SED (Fontanella, Gupta, Hiance-Steelesmith, & Valentine, 2015) and receive inadequate mental health care (Harper et al., 2014). These risk factors (i.e., SED, foster care) can lead to poor academic, physical, and social outcomes (Sanders, Munford, Liebenberg, & Ungar, 2014; Schneiderman, Leslie, Arnold-Clark, McDaniel, & Xie, 2011; Suldo, Thalji, & Ferron, 2011).

There is a growing criticism of the mental health treatments of our most vulnerable youth (i.e., those with SED and those in foster care). For example, the psychosocial treatments provided to this group of children and adolescents often are disconnected or are accessed through underfunded programs (Cunningham, 2009). Others argue that vulnerable youth are overmedicated (Zakriski et al., 2005) supported by findings that youth in state custody receive psychotropic medications at rates four to five times that of their peers (Martin, Van Hoof, Stubbe, Sherwin, & Scahill, 2003). Additionally, some researchers assert that vulnerable youth receive psychotropic prescription regimens that aren't consistent with evidenced-based practices (Brenner, Southerland, Burns, Wagner, & Farmer, 2014).

Evidenced-based interventions have been defined by various organizations and tend to include the requirement that an intervention have at least two between-group designs that show positive effects (APA Presidential Task Force on Evidence-Based Practice, 2006; Chambless et al., 1998). One difficulty in delivering existing evidenced-based interventions is a problem of

access. Namely, children and adolescents in foster care and with SED often come from low socio-economic status families and may have limited access to high quality mental health care (Cunningham, 2009). For example, Bruns and colleagues (2004) found that only 16% of youth in foster care receive adequate mental health services.

Wraparound is one approach that state agencies use to provide quality mental health care to youth from low socio-economic status families including youth with SED and youth in foster care who may otherwise receive inadequate and disjointed services (Bruns et al., 2014). Wraparound helps to address the need for continuity of care provided, which is important given findings that vulnerable youth often receive disjointed mental health care from multiple providers (Fontanella et al., 2015). In wraparound, a team determines the course and direction of treatment and can include parents, teachers, family members, service providers or any other person through which services can be coordinated and provided. This process is guided by wraparound principles (see Table 1), which emphasize accessing community support and utilizing a strengths-based approach that allows the youth and family to have input into treatment decisions (Bruns et al., 2004). It should be noted that individualized wraparound treatments typically include other evidence-based interventions, such as psychotropic medications and psychotherapeutic services.

Table 1. *Wraparound principles*

Wraparound Principle	Description
1. Family Voice and Choice	The family and child values and preferences are elicited and reflected in the treatment plan at all phases of wraparound
2. Team Based	The wraparound team is comprised of individuals who are agreed on by the family and who are committed to the family
3. Natural Supports	The wraparound team seeks participation of team members from the family's community and interpersonal relationships
4. Collaboration	The treatment plan should be developed through collaboration between all members of the wraparound team
5. Individualized	The wraparound team must be built on the individual strengths and needs of the children and families

Table 1 (cont'd)

6. Unconditional Commitment	The wraparound team needs to establish an unconditional commitment to the children and families
7. Flexible Resources	The wraparound team should use flexible approaches to treatment and receive flexible funding to meet the child and family's needs
8. Outcome-Based	Child, family, system, and program outcomes must be measured
9. Community-Based	The wraparound team focuses on treatments in the community and sources of natural support
10. Cultural Competence	The unique values and preferences of the child, family, and community are taken into account with treatment plans

Adapted from Bruns and colleagues, 2004

Wraparound itself can be considered an evidence-based approach to treatment for youth with SED due to the consistent findings across different research methodologies, diverse populations, and from multiple research groups for improvements in youth's mental health functioning. In a meta-analysis of wraparound research, Suter and Bruns (2009) analyzed nine studies of wraparound that compared treatment effects to a control group. In all outcomes, there was a superiority of wraparound services. They found that mean wraparound treatment effects (using Cohen's D) were medium for mental health outcomes (.31), and small for overall youth functioning (.25). More recently Bruns, Pullmann, Sather, Brinson, and Ramey (2014) built on this foundational research by testing wraparound in a randomized controlled trial. While there were not significant differences in outcomes between the wraparound and private intensive case management groups, both groups had significant improvements in mental health functioning. This suggests that youth show improvements in functioning when they are provided access to mental health services. It should be noted that there are limitations to wraparound research, including ethical difficulties implementing a true control group and lack of clarity differentiating between the varied treatments used within wraparound. However, the consistency of positive

effects within wraparound research clearly identifies a benefit for youth participating in wraparound.

Building off the research that consistently demonstrates positive effects of wraparound, it is important to also examine the components of wraparound that may be driving change. Bruns, Walrath, and Sheehan (2007) argue that it is vital to examine the relationship between the evidence-based treatments used within wraparound because the effectiveness of wraparound is driven both by the wraparound process and the services provided. Further, the evidence-based treatments used within wraparound do not necessarily include vulnerable youth within their research populations, further increasing the need to examine individual treatment components of wraparound with vulnerable youth (Bruns, Walker, Berstein, Daleiden, Pullman, & Chorpita, 2014).

The goals of wraparound address the importance and need to examine one specific component of treatment among others: psychotropic medications (Washington Revised Code, 2007). The use of psychopharmacological interventions within wraparound is not widely studied or understood. Psychotropic medications have potential benefits for children, however a lack of a clear understanding of how they are being used within wraparound creates a situation in which vulnerable youth may be receiving high rates of medications and combinations of medications that are not considered evidence-based. Recognition of these problems has prompted some states to provide additional oversight for youth in foster care that receive psychotropic medications (Simons, Pires, Hendricks, & Lipper, 2014).

However, there has been very limited research to address this issue potentially limiting the understanding of psychotropic medication use among vulnerable youth in wraparound. Information that is available about prescription practices in wraparound is limited to non-peer-

reviewed state reports, which have shown general decreases in medication use during wraparound (51% to 41%; Bouska, n.d.). Published research on psychiatric care within wraparound service delivery has been limited to one study focused on youth's desire to reduce psychotropic medication treatment (Moses, 2011). Harper, and colleagues (2014) assert that the lack of attention to psychiatric treatment practices within wraparound services misses the opportunity to gain a more complete understanding of the care that youth and families receive, especially given the increase in usage of psychotropic medications among youth reported nationally. Psychotropic medication rates for children more than doubled from 1995 to 2010 rising from 8% of physician office visits where psychotropic prescriptions were provided to 17% (Olfson, Blanco, Wang, Laje, & Cornell, 2014).

The dearth of empirical work focused on psychotropic treatments within wraparound has several implications for research and practice. Without a clear conceptualization of medication use, it is difficult for policy makers and practitioners to provide clear guidance to vulnerable youth and their families regarding potentially appropriate services. To fill this void in the research, empirical work is needed to determine if vulnerable youth in wraparound services are more at risk for receiving psychotropic medications that are potentially not consistent with best practices and determine policies to ensure vulnerable youth receive appropriate services.

Proponents of the use of psychotropic medication treatments within wraparound service delivery argue that this inclusion allows for (a) implementation of an ongoing psychotropic medication evaluation, (b) reductions in service delivery barriers between providers, and (c) increased collaboration across systems of mental health care while gaining an understanding of an important component of the mental health treatment of vulnerable youth (McGinty, Klaehn, Metz, Hodas, Larson, & Chenven, 2013). Others argue that it is important to critically examine

the use of psychotropic medications within wraparound given the increasing prevalence of psychopharmacological interventions to treat child and adolescent mental health issues (Harper et al., 2014).

The psychotropic medications that are most prevalent for vulnerable youth involved in pharmacotherapy are antidepressants (46-57%), psychostimulants/non-stimulants medications used to treat attention-deficit/hyperactivity disorder (ADHD; 51-56%), and antipsychotics (24-53%; Sullivan & Sadeh, 2015; Zito et al., 2008). All of these classes of medications have substantial empirical support for improving youth's mental health functioning, though also carry the risk of potentially serious side-effects (Correll et al., 2011; Kodish, Rockhill, Ryan, & Varley, 2011; Reyes, Buitelaar, Toren, Augustyns, & Erdekens, 2014).

Despite the evidence for the efficacy of psychotropic medications in treating a number of childhood mental health conditions, there are several reasons that the use of psychotropic prescription practices among vulnerable youth must be scrutinized. First, there is a growing trend of prescribing multiple psychotropic medications, polypharmacy, and prescribing medications from more than one class, multi-class treatments, despite these not being evidenced-based treatment approaches and the unknown side-effects that may result from taking multiple psychotropic medications, especially across classes (Morden & Goodman, 2012). Polypharmacy rates among youth prescribed psychotropic medication are substantially higher for youth in foster care compared to nationally representative samples of youth (76% v. 20%; Comer, Olfson, & Mojtabai, 2010; Michigan Foster Care Review Board, 2012). Second, some mental health professionals caution that there is an overreliance on psychiatric treatments of vulnerable youth (McMillen, Fedoravicius, Rowe, Zima, & Ware, 2007) as rates of psychotropic medications prescriptions are five times higher for youth in foster care compared to peers (Martin, Van Hoof,

Stubbe, Sherwin, & Scahill, 2003). Third, youth in foster care are also more likely than their peers (17% v. 3%) to receive medications with more significant side-effects, such as antipsychotics (Burcu, Zito, Ibe, & Safer, 2014) providing further support for the need to closely examine psychotropic treatment practices within populations of vulnerable youth who are receiving community-based wraparound services.

In addition, there are several important ethical considerations that further support the importance of examining psychiatric treatment practices within vulnerable youth receiving wraparound. First, this group may not have consistent adults in their lives who are able to advocate for their care or provide comprehensive assessment information, both of which can lead to ineffective treatment (Crismon & Argo, 2009). Additionally, some youth may feel coerced into treatment, especially psychotropic treatment, and they may subvert the process through low rates of medication adherence (Moses, 2011). Treatment decisions pertaining to psychotropic medications within the wraparound process can address several of the ethical and health concerns raised. Specifically, implementing ongoing assessments, providing a voice to children and families in treatment decision making, and affording system-level advocacy for high quality care are all essential components of wraparound service delivery.

The purpose of this study was to examine the psychotropic prescription practices for youth with SED who received wraparound care and the changes that occurred in this psychiatric practice throughout the wraparound service delivery process. This study provides a prevalence rate of psychotropic medication use among youth at entry into wraparound services. The following use rates were also examined: (a) single psychotropic medication prescriptions (monotherapy), (b) multiple psychotropic medications (polypharmacy), (c) concurrent psychotropic medications from multiple classes (multi-class treatments), and (d) psychotropic

medications within specific drug classes. Changes in medication prescription practices were examined through using generalized linear mixed models to determine overall changes in the number of medications prescribed as well as the prevalence and changes within common classes of medications. The role of foster status, gender, age, and type of county in which services were provided (urban vs. rural) were examined given findings of differential medication rates based on these demographic characteristics (Campbell, Kearns, & Patchin, 2006; McMillen & Raghavan, 2009; Sullivan & Sadeh, 2015; Zito et al., 2008). Changes in mental health functioning were compared across patterns of medication prescription practices during wraparound to determine if medications could be reduced without the unintended consequence of reductions in mental health functioning. Additionally, changes in functioning associated with initiating psychotropic medications within wraparound service delivery were examined.

Chapter 2: Literature Review

Conceptual framework

A conceptual model of the literature review is presented in Figure 1 of Appendix A. According to this model, youth with Serious Emotional Disturbances (SED) and youth with SED in foster care, vulnerable youth, are at higher risk for mental health concerns and poorer outcomes. These youth often do not receive appropriate mental health care leading to a need to better address the mental health difficulties of vulnerable youth (Fontanella et al., 2015). A common approach to addressing the mental health needs of vulnerable youth is through psychotropic medication. In fact, vulnerable youth are more likely to receive medications to treat their mental health difficulties than their peers, thus leading some to question the overmedication and potentially unnecessary exposure to risk of side-effects for vulnerable youth (Zakriski et al., 2005). It is important to note the advantages that medications offer vulnerable youth, especially when considering the lack of access to mental health care. Medications offer a high ease of use (i.e., take a pill), have relatively rapid onset of therapeutic effects, and have a large body of research supporting efficacious results (e.g., Correll et al., 2011; Sibley et al., 2014; Tsapakis et al., 2008).

While medications offer advantages to children who have difficulty accessing services especially as related to improved mental health outcomes, there are three primary limitations that need be carefully examined in considering treatment approaches. The first limitation of psychotropic medications is the potential for side-effects. These possible side-effects range from irritability and sleep disturbances with stimulants to movement disorders with antipsychotic medications and suicidal ideation with antidepressants (Corell et al., 2011). A second limitation involves prescribing medications inconsistent with evidence-based practices, such as prescribing multiple medications for one mental health concern (Morden & Goodman, 2012). Lastly,

prescribing psychotropic medications presents possible ethical challenges, such as informed consent (Delman, Clark, Eisen, & Parker, 2015).

An alternative to relying exclusively on psychotropic medication is presented on the right side of the model. Wraparound can both increase the effectiveness of youth's overall mental health treatment and also address the limitations of psychotropic medications. Wraparound can increase the level of communication and collaboration between service providers to address ethical challenges and can facilitate access to psychosocial and psychotropic medications as needed (Harper et al., 2014). In this way, wraparound can theoretically address the need to provide mental health care to vulnerable youth and reduce the need for psychotropic medications while addressing other concerns with psychotropic medication practices. Many have called for investigation of the role of wraparound in the context of psychotropic medication treatments (e.g., Harper et al., 2014), though this area of research still needs to be addressed empirically.

The following literature review first describes the populations that are used within the study. An overview of vulnerable youth is provided including a definition of this group, their unique status within our society as well as a model describing increased risk for negative outcomes. Specific attention is given to youth with Serious Emotional Disturbance (SED) and youth in foster care given their relevance to the current study. Next, wraparound services are described and reviewed in light of evidence-based treatments. Lastly, psychotropic medications commonly prescribed to vulnerable youth are reviewed including their empirical support as well as potential practical and ethical challenges associated with psychopharmacology among vulnerable youth. It is suggested that wraparound can help address several of the problems with psychotropic medication practices in vulnerable youth.

Vulnerable Youth

Vulnerable youth is a term used to describe a heterogeneous group that, by virtue of their disability or circumstance, confront challenges that are "over and above those faced by young people in general," (Osgood, Foster, & Courtney, 2010, p. 210). This term can encompass youth from a variety of groups including those with chronic mental or physical illnesses or disabilities, youth in foster care, youth in the juvenile justice system, and youth without permanent homes. This literature review and study focus on youth with serious emotional disturbance (SED) and youth with SED living in foster care due to increased risk associated with these groups for lower mental health functioning, poorer educational outcomes, increased family strain, increased contact with law enforcement and increased difficulty in the transition into adulthood (Osgood et al., 2010). Not all vulnerable youth have poor outcomes, but rather the relative risk of adverse outcomes is increased for this population compared to youth not classified as vulnerable.

It is also important to recognize that children and adolescents are generally considered as more vulnerable than adults. Recognition of the need to protect children and adolescents is evident in federal initiatives (i.e., Americans with Disabilities Act, 1990) and is a fundamental feature of the ethical codes that guide mental health practitioners (i.e., American Psychiatric Association, 2010). Children and adolescents in general are considered as a vulnerable population for several reasons including the power differential between children and adults, children's reduced capacity for understanding and consenting to treatment, and children's reduced capacity for self-determination (Punch, 2002). Children's brains are still developing leading them to have difficulty considering consequences and using logic (Siegler & Alibali, 2004). Children can also be unduly and negatively influenced (i.e., adults deciding what children should do) without the capacity or ability to appropriately make decisions. Therefore, there are

special protections put in place to protect children from harm (i.e., Institutional Review Boards, Children Protective Services).

In light of the special protections and recognition provided to children and adolescents, it is important to consider that vulnerable youth are particularly susceptible to negative outcomes and often have fewer protections, such as stable caregivers, than youth in general. Given the higher rates of mental health concerns among vulnerable youth, there is a need to give this group increased attention in clinical care and research in order to protect this group, help them to access effective services, and improve their mental health outcomes through the provision of quality care (Perrino et al., 2014).

One consideration is the potential for cumulative negative effects from being associated with multiple vulnerable populations such as those with SED in foster care. The literature often studies the independent effects of each vulnerable population, though the interactive effects may also be important to examine given the potential for compounding risk for negative outcomes (Evans, Li, & Whipple, 2013). The sections below focus on youth with SED and youth in foster care separately to highlight the increased risks associated with each group, but also describe the increased risk for SED among youth in foster care.

Serious emotional disturbance

Serious emotional disturbance (SED) is a general classification used to identify a child or adolescent who has a diagnosable mental health disorder and has severe impairments in functioning (e.g., academic, social). Early definitions of SED in the research literature were limited to considering children who were in an inpatient or residential mental health facility or receiving special education services for serious emotional and/or behavioral disturbances (Greenbaum et al., 1996). Other more contemporary definitions of SED largely match previous

conceptualizations without the inpatient or residential requirement. For example, Painter (2012) defined SED as a youth experiencing mental health symptoms that cause significant impairment in functioning. Painter (2012) also adds certain recommendations that children with SED should have symptoms that can be expected to persist for at least a year and require multiple types of services (e.g., mental health, social services). Children with SED present with a diverse array of diagnoses and functional impairments. However, a unifying feature for this group is that they have a high degree of impairment in their daily functioning due to their symptoms and challenges.

Attention to youth with SED increased in the 1980's due to a greater understanding of these children and the mental health systems through which they are served (Duchnowski & Friedman, 1990). A national survey found that among the children with SED only around two-thirds were receiving adequate mental health care to address their needs (Knitzer & Olson, 1982). The low level of care and the poor outcomes for children with SED led the National Institute of Mental Health and United States Department of Education to prioritize funding to better understand this vulnerable population (Greenbaum et al., 1996). One result of the partnership between the National Institute of Mental Health and the Department of Education was the creation of National Adolescent and Child Treatment Study (NACTS; Greenbaum et al., 1996). The NACTS revealed that children with SED and their families receive care from a wide variety of service providers including individual counseling (50%), psychiatric services (26%), special education (55%), group therapy (27%), and psychological testing (32%). Notably, a trained professional did not necessarily coordinate these services, but rather the families of children with SED had to navigate these services and provide communication between the service providers. This role for caregivers can be difficult, especially given the increased levels

of strain found in caregivers of children with SED (Osgood, Foster, & Courtney, 2010) and underscores the need for mental health care coordination and systems-level advocacy through a process like wraparound services.

Contemporary research has largely echoed the pattern for high levels of unmet need for children with SED and has also highlighted that when mental health services are accessed, they are often provided in a disconnected fashion (Bruns et al., 2010). As a result of complex needs and lack of coordinated care, youth with SED have high rates of contact with the juvenile justice system (67%) and low rates of high school completion (60%; Greenbaum et al., 1996). Children with SED are at an increased risk for physiological problems (Vreeland, 2007), have fewer employment opportunities in adulthood (Wagner & Newman, 2012), and their families have decreased levels of productivity (Tolan & Dodge, 2005). Osgood and colleagues (2010) highlight that youth with SED often have reduced family support as evidenced by higher caregiver ratings of strain related to difficulties with their children and often are in families with limited financial resources.

As a result of the limited-financial resources and complex needs, youth with SED and their families often rely on state-sponsored mental health services (Osgood et al., 2010). These youth and families have unique needs and often require services from multiple providers across different contexts. As such, it is beneficial to provide individualized and collaborative mental health care. States (e.g., Louisiana, Massachusetts, Michigan; Simons, Pires, Hendricks, & Lipper, 2014) often utilize wraparound to provide comprehensive services to youth presenting with the greatest need (Bruns, et al., 2014). Wraparound can be beneficial for youth with SED because it allows for individualized supports that build on family and community strengths to

provide ongoing assistance to youth with SED and their families. Wraparound can also provide access to mental health care and increasing service provider communication and collaboration.

Foster care

Youth are placed into foster care when their home environments are considered to be detrimental to their development or when there is no caregiver available to them. The majority of youth are in foster care due to parental abuse or neglect, while other youth are in foster care due to abandonment or lack of available caregivers (Ryan, 2012; Takayama, Wolfe, & Coulter, 1998). Youth in foster care are at an increased risk for homelessness, involvement with the juvenile justice system (Ryan, Marshall, Herz, & Hernandez, 2008), and physical health problems (Schneiderman et al., 2011). Additionally, youth in foster care are at an increased risk for SED (McMillen et al., 2005). When youth have multiple risk factors, such as being in foster care and SED, the severity of their difficulties tends to be greater than when only one risk factor is present (Persi & Sisson, 2008). The increased risk for negative outcomes for youth in foster care is hypothesized to come from the difficulties transitioning from their communities to new families, schools, and peers. As Rauso, Ly, Lee, and Jarosz (2009) highlight, "When youth are removed from their caregivers, foster youth are often placed with strangers, usually outside their community. They frequently change schools, lose contact with friends, and must adapt to a new placement and community" (p. 63). The separation from their families, frequent transitions and new environments act to increase the risk for negative mental health outcomes and can lead foster youth to disproportionately be placed in residential care and psychiatric hospitals (Rauso et al., 2009). It is important to understand that while these youth are at an increased risk for negative outcomes, many potential factors (i.e., mental health interventions, positive relationships with adults) have the potential to mitigate these risks (Leve et al., 2012)

An analysis of 415 youth in foster care revealed a significant relationship between behavior problems and transitions between foster care placements (Newton, Litrownik, & Landsverk, 2000). In particular, they noted a reciprocal relationship such that transitions resulted in increased behavioral problems and that increased behavioral problems resulted in increased transitions between different families. As behavior problems increase, the youth's risk of developing SED, having academic difficulties, and having difficulty attaching to caregivers also increase. As a result, there is increased pressure on states to find ways to reduce behavior and mental health problems in youth who are in foster care (Blakey et al., 2012).

There is an unmet need for mental health services among youth in foster care (Woods, Farineau, & McWey, 2013). Using a national database, Bruns and colleagues (2004) found that about half of the youth in foster care had clinically significant symptoms of mental health disorders and 56% of youth with clinically significant symptoms of mental health disorders had SED. As a whole, only 16% of youth in foster care received adequate mental health services. This discrepancy underscores the need for increased screening, assessment, and access to mental health services in order to address the needs of this vulnerable population.

When youth in foster care receive mental health services, they tend to receive psychotropic medications more frequently than their peers. An analysis of Medicaid data revealed that youth in state custody are four to five times more likely to be prescribed a psychotropic medication and two to three times more likely to receive multiple medications concurrently than their peers (Martin, Van Hoof, Stubbe, Sherwin, & Scahill, 2003). Further, youth in foster care are more likely than their peers to receive medications that carry a significant potential risk of side-effects, such as antipsychotic medication (Burcu et al., 2014). This is particularly problematic given the vulnerable nature of youth in foster care and the potential low

level of oversight for the treatment of youth in foster care. An annual report published by the Michigan Foster Care Review Board (2012) noted that a lack of a consistent adult for foster care youth led to a lack of understanding of the youth's treatment history and current medication usage, which may have increased medication rates. Additionally, this report noted that 76% of youth in foster care who receive psychotropic medications receive more than one medication to treat mental health concerns, which is a substantially higher percentage than the 20% for youth overall reported nationally (Comer, Olfson, & Mojtabai, 2010). These high rates of polypharmacy create a number of ethical concerns, and underscore the need for close attention to system-level advocacy for quality care and providing coordinated mental health care across different types of services.

Wraparound Care for Vulnerable Youth

The evidence-based movement in mental health emphasizes the need for high-quality research to determine the efficacy of mental health interventions (Hoagwood, et al., 2014). The American Psychological Association (2006) has highlighted three categories of evidenced-based mental health interventions: psychosocial, psychotropic, and combined. Psychosocial interventions for vulnerable populations often include family-focused treatments that are used to improve the family system's ability to address youth's mental health symptoms and positively influence youth's development (Kaslow, Broth, Smith, & Collins, 2012). A second type of evidenced-based psychosocial interventions for vulnerable populations include school-based interventions, which can vary from individualized contingency management strategies to school-wide behavioral supports (Rathvon, 2008). Psychotropic medications, discussed at length in the next section, involve altering the availability or action of neurotransmitters in order to regulate behavior (Crismon & Argo, 2009). Combined interventions involve the use of psychosocial and

psychotropic medications to treat mental health concerns and are consistent with American Academy of Child and Adolescent Psychiatry (2001) recommendations to provide multi-modal treatment to vulnerable youth.

Wraparound is a psychosocial approach that can facilitate access to psychotropic medications as needed. It is a process that uses a team-based model of care to coordinate and individualize mental health treatment (Bruns et al., 2014). Due to the varying needs of vulnerable youth, there are multiple and diverse service providers that are required to effectively provide interventions for vulnerable youth. Interacting with multiple providers and navigating the governmental agencies required to receive services can be a complex and difficult task. Given this, it is perhaps not surprising that the traditional models of service delivery in which patients are required to manage their care do not typically produce positive outcomes for youth with intensive needs (Burchard, Bruns, & Burchard, 2002). Wraparound is an attempt to provide comprehensive and coordinated care rather than accessing care through multiple distinct systems (i.e., mental health, social services, education; Bruns, Burchard, & Yoe, 1995).

Wraparound is, at its core, a method to provide services to youth and families in an individual, flexible, strengths-based, and coordinated manner in order to address youth and family needs. The wraparound approach is centered on the wraparound team. The wraparound team can include anyone that provides services or support to the youth, such as family members, friends, physicians, probation officers, social workers, and teachers. The wraparound team, guided by a facilitator, creates a treatment plan and helps to ensure successful utilization of the treatment plan. The treatment plan is created to address each individual child's areas of difficulty while building of the child's and the community's strengths (Bruns et al., 2014). For example, a youth that has ongoing delinquency issues may have a team that increases supervision after

school, provides activities to do after school, and provides weekly therapy to address emotional difficulties. As a result of the idiosyncratic nature of the treatment plans, the services and supports that one family receives may be entirely different from those of another family. A series of wraparound principles have been established in order to guide this approach (see Table 1), and emphasize accessing community support and utilizing a strengths-based approach to allow the youth and family a voice in the direction of treatment (Bruns et al., 2004). It is the wraparound facilitator's responsibility to (a) determine the needs of the youth and the family (b) ensure that appropriate services are provided, and (c) facilitate collaboration between team members, including service providers.

Wraparound outcomes research. The evidence base for wraparound indicates that there are mostly positive outcomes for vulnerable youth who participate in wraparound in terms of improvement in mental health functioning. It is important to keep in mind that the populations investigated typically involve youth with SED and youth with SED in foster care, whose impairments are not readily addressed through traditional service delivery models. Traditional models often involve disconnected service providers treating one area of difficulty for children and families, but not providing comprehensive, coordinated care. There are several methodological and ethical challenges associated with studying vulnerable youth that potentially limit the ability to determine the effects of wraparound. Such challenges can help explain why the literature on wraparound tends to emphasize evaluation of ongoing projects rather than randomized controlled research.

The majority of wraparound studies focus primarily on changes in mental health functioning for youth with SED who receive wraparound services and do not examine specific aspects of treatment, such as psychotropic medications. This omission in the research likely

stems from the lack of a standardized treatment and the individualized nature of wraparound treatment plans. An examination of individual components of wraparound care, such as psychotropic medication practices, is warranted due to the high rate of usage among this population (Zito et al., 2008).

Case studies. Several early studies of wraparound largely relied on case studies to examine the effects of wraparound services. One of the first case studies involved personal interviews with the wraparound teams of 10 youth involved in the Alaska Youth Initiative (Burchard, Burchard, Sewell, & VanDenBerg, 1993). After around one to two years of treatment, all of the youth lived in community-based settings, five did not require further services, four continued to receive services and were described as stable, and the last youth was descried as having unstable functioning.

A second early case study was conducted in 1996 and involved eight children enrolled in the Kaleidoscope program in Chicago (Suter & Bruns, 2008). The children enrolled in wraparound services for a variety of presenting problems including abuse and neglect histories, substance abuse, and severe mental health problems. These children were enrolled for an average of three years. Through interviews, the author concluded that all the youth were living in more stable environments and had significantly reduced the behaviors that led to referral to wraparound. The primary purpose of these two case studies was to provide a detailed description of the wraparound process. Ultimately, it is difficult to draw conclusions about the effects of wraparound from these two early studies given the lack of a control group, the limited sample size, and lack of quantitative data.

Pre-post design. There have been numerous studies that utilize a pre-post research design when evaluating ongoing wraparound services. This research design has the benefit of examining

existing practices, though the lack of a control group makes it more difficult to determine if changes were due to wraparound or other variables. These studies have found generally positive effects on children's behaviors (Bruns, Burchard, & Yoe, 1995), adjustment to the community (Hyde, Burchard, & Woodworth, 1996), and restrictiveness of living situations (Yoe, Santarcangelo, Atkins, & Burchard, 1996). Bruns and colleagues (1995) examined child outcomes after receiving wraparound services for one year. The 27 cases included in this analysis demonstrated significant emotional and behavioral difficulties as wraparound services were initiated. After receiving wraparound services for one year, the children had significantly reduced ratings of behavior problems and increased ratings of compliance with adults. These youth were also reported to live in less restrictive placements than before they began wraparound services.

Yoe and colleagues (1996) utilized similar methods for a group of 40 children with SED to more closely examine the residential outcomes of youth participating in wraparound. Of the 40 youth, 42% of them were in non-community placements (i.e., residential treatment centers) when they began receiving wraparound services. After one year of participation in wraparound, only 10% of these youth were not living in community-based placements. This sample also demonstrated a reduction in problematic behaviors. Notably, there was an increase in youth receiving services at school indicating that wraparound may have been able to facilitate appropriate treatments across settings.

A more recent study to use pre-post design (Anderson, Wright, Kelley, & Kooreman, 2008) examined an ongoing wraparound project. The 354 youth analyzed in this study demonstrated significant decreases in problematic behaviors, and increases in mental health functioning as evidenced by the Child and Adolescent Functional Assessment Scale (CAFAS;

Hodges, 1990), the Child Behavior Checklist (CBCL, Achenbach, 1991) and the Behavioral and Emotional Rating Scale (BERS, Epstein, 1999). This study also found an effect of referral source such that youth referred from juvenile justice or education settings had a more rapid improvement in functioning and mental health symptoms than those from other referral sources.

Quasi-experimental design. Mears, Yaffe, and Harris (2009) compared 93 youth who received wraparound to 30 youth receiving typical case management via quasi-experimental research design. Here, all youth had SED, 48 of the wraparound group and all youth in the comparison group were in foster care. The youth receiving wraparound care had significantly greater improvements in functioning than the youth in traditional care as measured by the CAFAS. There were not significant differences related to contact with law enforcement, educational outcomes, or abuse and neglect reports.

A second quasi-experimental design study compared youth who completed wraparound treatment to youth who completed residential treatment and then received typical child welfare services (Rauso et al., 2009). Here, the analysis focused on outcomes related to the placement for youth in foster care and the overall cost to the community mental health system. In the 12 months after completion of wraparound or residential treatment, those that received wraparound had significantly fewer out of home placements. The majority of placements for youth who received wraparound services were living in community settings. Conversely, the majority of placements for youth receiving typical care were in non-community placements, such as residential treatment. Analyzing the placements is important, in part, because there is an increased risk of poor mental health functioning when youth live in out-of-home placements. The authors also calculated that providing wraparound services takes roughly one-third of the financial resources as typical treatment.

Bruns, Suter, and Leverentz-Brady (2006) conducted a quasi-experimental design study to compare youth in foster care with SED who received wraparound to those who received typical care across four regions. There were a total of 33 children who received wraparound care who were matched to children receiving care according to a typical caseworker model. Bruns and colleagues (2006) found that participation in wraparound was significantly related to improved mental health symptoms, less restrictive and more stable housing, improved school performance, and reduced substance abuse.

Not all studies utilizing quasi-experimental design found superior effects of wraparound. Bickman, Smith, Lambert, and Andrade (2003) evaluated the effectiveness and costs associated with wraparound or treatment as usual for 111 youth. This study used 17 assessments to gain a comprehensive understanding of the youth and the process of wraparound care. The two groups had very similar and positive outcomes across all variables. The authors highlighted that those in the wraparound group received more services related to wraparound, which may have resulted in an increased cost compared to treatment as usual.

Experimental design. There have been relatively few wraparound studies to utilize experimental design. The available experimental design studies generally find that youth receiving wraparound show improvements in mental health functioning but that these improvements are not greater than comparison groups receiving alternative types of mental health care. An early example of experimental design using wraparound examined the housing placements of 132 youth in foster care at high-risk for or identified with behavioral or emotional disturbances (Clark, Lee, Prange, & McDonald, 1996). The youth receiving wraparound were compared to a treatment as usual group and the study authors found reductions in the number of placement for the wraparound group but found no differences in incarceration rates or the

average length of time youth ran away from home. No measures of mental health functioning were examined in this study.

A more contemporary example of utilizing experimental design that measured mental health outcomes comes from Bruns, Pullmann, Sather, Brinson, and Ramey (2014). These researchers randomly assigned 93 youth to receive wraparound care provided by a state agency or intensive case management provided by a private mental health organization. The youth met eligibility for SED, had elevated CAFAS scores, and two-thirds of the youth were in foster care at the beginning of treatment. There were not significant differences in outcomes between the wraparound and intensive case management groups, though both groups had significant improvements in mental health functioning as evidenced by reduced CAFAS scores. The authors noted that there was a low adherence to wraparound principles calling into question the degree to which the wraparound group truly received wraparound care. Additionally, neither study used a true control group, but rather had control groups receiving alternative treatments, which may potentially confound the results. However, it is of note that both interventions produced positive results, even if the wraparound group did not have more favorable outcomes.

Meta-analysis. Suter and Bruns (2009) conducted a meta-analysis of seven studies that reported on treatment differences between youth in wraparound treatment and a comparison group. They found mean treatment effects (using Cohen's D) were highest for wraparound improving the living situation for youth (α=.44) representing a medium effect size. There were medium effects for mental health outcomes (α=.31), and small effects for overall youth functioning (α=.25), functioning in school (α=.27), and contact with the juvenile justice system (α=.21). Taken together, the authors calculated an overall mean effect of wraparound to be medium (α=.33).

Conclusions and future directions of wraparound research. There is mounting evidence that wraparound can have positive effects on the mental health functioning of vulnerable youth. There are fairly consistent results across various research methodologies suggesting that wraparound can improve youth functioning, and reduce mental health problems. Notably, the two studies that came to the least favorable conclusions (Bickman et al., 2003; Bruns et al., 2014) still indicated that youth receiving wraparound had improvements in mental health functioning, but may not have improved to a greater degree than youth receiving care through other treatment models. As noted by Bruns and colleagues (2014), a shortcoming in wraparound research is a lack of an understanding of how adherence to wraparound principles could affect child outcomes.

Another potential critique of wraparound research for youth with SED and in youth in foster care deals with the research methodology. There are relatively few experimental design studies while pre-post design, and quasi-experimental studies are prevalent in wraparound research. A reliance on pre-post design and quasi-experimental design studies limit the confidence with which researchers can ascribe improvements to the wraparound process. However, there are ethical challenges associated with identifying youth with significant impairments and assigning them to a true control group that does not receive services. This is why the experimental research described previously (Bruns et al., 2014; Clark et al., 1996) did not use a true control group, but rather used an alternative treatment for the comparison group. In this way, even the experimental research may not be able to clearly differentiate the effects of wraparound research from potential mediating and moderating variables. Further complicating wraparound research is a difficulty defining the services that youth receive as part of wraparound

and measuring the fidelity to services. Despite these shortcomings, experimental research can provide important information about child outcomes related to wraparound.

However, the benefits of experimental research with this group also carry potential drawbacks. A potential criticism of more intensive research methodologies with programs like wraparound is that there is a lack of sustainability after the research project ends. That is, the research projects that utilize experimental design tend to bring extensive resources into a community mental health system, and that system becomes reliant on these resources. Then when the study ends, the community mental health systems may not be able sustain the intervention without the external funding from the researchers (Trickett et al., 2011). Evaluation research, as seen with pre-post designs, does not necessarily create this reliance and is able to provide information about wraparound, though may not be able to clearly attribute changes to the wraparound process.

Another important trend in wraparound research is that there is an almost exclusive focus on child mental health functioning, and to some degree residential settings. Future research should seek a more detailed understanding of the effects of different components of wraparound care. Bruns and colleagues (2014) argue that it is important to examine the individual treatments selected within wraparound in order to ensure high-quality service delivery. They highlight that evidence-based treatments may work differently for youth with SED and therefore a close examination of the services youth receive is vital to wraparound research. Harper, Sargent and Fernando (2014) assert that it is particularly important to examine the evidence-based treatment of psychotropic medications within wraparound services in order to gain a more complete understanding of the care that youth and families receive. Examining psychotropic medications is of interest because vulnerable youth tend to use psychotropic medication four to five times

higher, have polypharmacy rates two to three times higher (Martin et al., 2003), and have antipsychotics medications rates three to four times higher (Burcu et al., 2014) than their peers. It is unclear whether treatment effects are gained through increased access to psychotropic medication resulting in fewer mental health problems, or if the wraparound approach may result in improved functioning and decreased reliance on medication.

While wraparound can provide access to services, there is variation in the availability of psychiatric services. In a national study of the availability of child psychiatrists, Thomas and Holzer (2006) noted a disproportionately lower number of child psychiatrists in rural areas as compared to urban areas. This coupled with increased distances between providers in rural areas creates potential barriers to services. Campbell, Kearns, and Patchin (2006) surveyed psychologists in urban and rural areas and found that there was a general shortage in the number and variety of mental health providers in rural areas compared to urban areas. Wraparound can help address certain institutional barriers to access services such as navigating health systems and coordinating care, though differences may still exist based on child location.

The effects of psychotropic medications have been examined in a related area of research. Huefner, Griffith, Smith, Vollmer, and Leslie (2014) examined changes in psychotropic medication prescription practices for 228 youth with SED in an intensive residential treatment center. While in treatment, there was a reduction from 80% of children taking medications to 67% of youth taking medications, which corresponded to a reduction in the average number of medications from 2.5 to 1.3. Despite the decreases in medication, mental health functioning was improved. The authors argue that these results indicate that these youth were originally taking more medications than necessary given the improvement in mental health functioning despite reduced psychotropic medication prescriptions. The intervention used in this study differs from

wraparound in that it took place in a highly controlled and secure residential setting whereas wraparound services occur in a community context. As a result of the community context, there is a greater variety in the service providers for wraparound compared to those available in a single residential setting. However, the trends found by Huefner and colleagues (2014) are consistent with goals of wraparound to decrease the need for psychotropic medications in youth with SED and provide access to high quality services to those most in need.

The increasing interest in examining psychotropic medications within wraparound is in line with American Academy of Child and Adolescent Psychiatry (AACAP; 2001) recommendations for treating youth in foster care through multimodal treatments, such as in wraparound. Some psychiatrists note that their profession does not typically have a direct role in wraparound care but can be an important part of the team by lending expertise related to psychotropic medication and other mental health interventions (McGinty et al., 2013). Still others in psychiatry argue that wraparound helps address some of the difficulties in clinical practice, such as disjointed and ineffective communication between clinicians and families (Harper et al., 2014). In some non-empirical reports an increase in the wraparound team's focus on psychotropic treatments by adding a child and adolescent psychiatrist to the wraparound team has appeared to have positive effects for some wraparound treatment facilities and increased communication between service providers (Miline, 2014).

It should be noted that with this increase in attention, there has been only one study that focused on psychotropic medications in wraparound, though this study did not measure psychotropic medication outcomes (Moses, 2011). In this study, adolescents receiving wraparound were assessed to determine their commitment to continue receiving psychotropic medications. Of the 50 participants, 62% indicated that they would discontinue psychotropic

medications if the decision were solely theirs. The most common reasons youth wanted to discontinue medication were that they felt coerced into taking the medications, were concerned about the side-effects of the medications, felt that taking medication was bothersome, were worried about the stigma of medication, and thought the medications were not necessary. There was no examination of changes in medications or changes in mental health functioning included as part of this study.

The relative lack of empirical research on the subject of psychotropic medication practices and outcomes among vulnerable youth in wraparound comes despite the interest of those in the medical community (McGinty et al., 2013), concerns about overmedicating vulnerable youth (McMillen et al., 2007), and the interest in closely examining the need for psychotropic medication prescription practices with vulnerable youth (Crismon & Argo, 2009). Assessing wraparound's impact on psychotropic prescription practices may help address the need to find strategies to reduce the need for psychotropic medications. Wraparound has the potential to address the concerns about overmedicating youth by providing youth access to alternative treatment options and by increasing the communication and collaboration between families and care providers, including psychiatrists and physicians.

Psychotropic Medication with Vulnerable Youth

Psychotropic medications are used to increase children's functioning while decreasing mental health problems. There are a wide variety of psychotropic medications available to treat mental health concerns in pediatric populations. Table 2 provides an overview of the most common types of psychotropic medications used with vulnerable youth.

Table 2. *Common psychotropic medications for vulnerable youth*

Medication Class	Generic Name	Brand Name
Antidepressant		
SSRI	Fluoxetine	Prozac
	Sertraline	Zoloft
Medication for ADHD		
Stimulant	Amphetamines	Adderall
	Methylphenidate	Ritalin, Concerta
Nonstimulant	Atomoxetine	Strattera
	Guanfacine	Tenex
Antipsychotic		
Atypical	Risperidone	Risperdal
	Aripiprazole	Abilify
Anxiolytics		
Benzodiazepines	Diazepam	Valium
	Alprazolam	Xanax
Other	Hydroxyzine	Atarax
Mood Stabilizers		
	Lithium Carbonate	Eskalith, Lithobid
Anticonvulsants*	Oxcarbazepine	Trileptal
Anticohlergenics **	Benztropine	Cogetin

Adapted from Preston, O'Neal, & Talaga, 2010; Stahl, 2014; Zito et al., 2008
*can be used to treat bipolar; ** can be used to augment antipsychotic medication and/or treat side-effects

The literature reviewed here provides an overview of the three most common classes of medications prescribed to vulnerable youth (antidepressants, ADHD medications, and antipsychotics; Zito et al., 2008). There is no indication that psychotropic medications would work differently for vulnerable youth (Crismon & Argo, 2009) and so general findings within pediatric populations are presented here with some differences in prescription practices for certain groups noted. The pharmacological method of action for each class of medication is briefly described in order to provide background information about these medications and describe how they work. Next, the evidence-base for each class of medication is detailed including an examination of polypharmacy and multi-class treatments. The potential side-effects of each type of medication are detailed to highlight the need to find alternative and

complementary treatments to reduce the need for psychotropic medications. This section is concluded with a discussion of the ethical concerns surrounding prescribing psychotropic medications to vulnerable youth in order to highlight areas that can be addressed though using a wraparound treatment approach, such as reducing overmedication, providing access to alternative treatments, and increasing communication between health care providers.

Prevalence and trends in psychotropic medication for youth. The most common types of medications prescribed to vulnerable youth are antidepressants (46-57%), and antipsychotic medications (24-53%) and medications for attention-deficit/hyperactivity disorder (56%). Other common medications in this population include lithium and anticonvulsants, though these are often used in conjunction with other medications (Martin et al., 2003; Sullivan & Sadeh, 2015; Zito et al., 2008)

There is a trend for increased psychotropic medication usage among national samples of youth. For antidepressant medications there was an annual increase of 9% for the years between 1998 and 2002 and this rate appears to be steadily increasing (Delate, Gelenberg, Simmons, & Motheral, 2014). Around 4% of children are reported to take medications to treat attention-deficit/hyperactivity disorder (ADHD), and this rate has increased by around 10% annually (Castle, Aubert, Verbrugge, Khalid, & Epstein, 2007). The rate of increase for antipsychotic medication prescriptions has gone up at an even higher rate. Between 2002 and 2007 there was a total increase of 62% for antipsychotic medication usage. Between 1993 and 2009 the number of physician office visits in which an antipsychotic medication was prescribed rose from 0.24 to 1.83 per 100 children and from .78 to 3.76 per 100 adolescents. Between 2005 and 2009, nearly one-third of office visits to a psychiatrist resulted in antipsychotic medication prescriptions for youth. Much of the increase in antipsychotic medications can be attributed to the relatively

newer atypical antipsychotic medications (Patel et al., 2005). The prescription practices are not uniform across all youth. For example, children with public insurance, such as those in foster care, have nearly double the rate of physician visits with antipsychotic medication than their peers with private insurance (Olfson, Blanco, Liu, Wang, & Correll, 2012).

In addition to SED status, foster care status, age, and gender appear to play a significant role in prescriptions practices. Estimates indicate that 73% of youth in foster care who take psychotropic medications are prescribed multiple psychoactive substances indicating that being in the foster system increases the risk for being prescribed multiple psychotropic medications (Zito et al., 2008). Older children also have higher rates of psychotropic medication prescriptions (Martin et al., 2003; Sullivan & Sadeh, 2015) and respond more favorably than younger children (Tsapakis et al., 2008). It is promising that those that respond more favorably (i.e., older children) also receive medications at high rates, though age is an important when considering psychotropic prescription practices. Gender also appears to play a role with males showing higher rates of receiving any psychotropic medication and receiving multiple psychotropic medications (Martin et al., 2003; Sullivan & Sadeh, 2015). Gender differences in receiving psychotropic medications may be partially explained by higher rates of SED in males (Garland, Hough, McCabe, Yeh, Wood, & Aarons, 2001).

One area that has received significant national attention is the use of antipsychotic medications among youth in foster care. Research suggests that youth in foster care receive antipsychotic medications at a rate comparable to youth living in the community with psychiatric disabilities (dosReis et al., 2011). This suggests that being in foster care is a similar risk factor for being prescribed an antipsychotic medication as having a serious psychiatric diagnosis. This similarity could be partially explained by higher rates of psychiatric disabilities in youth living in

foster care. Nevertheless, these high rates of antipsychotic medications among youth in foster care highlight to need to critically examine antipsychotic medication practices and patterns among vulnerable youth to ensure appropriate treatment.

It is important to note that increasing usage of psychotropic medications comes despite a history of a relatively underdeveloped empirical basis for psychopharmacology in pediatric populations. Many practitioners rely on extrapolating findings from adult populations to children and on off-label uses of medication in order to meet the needs of their clients (Vitiello, 2007). There are several physiological factors that could cause different reactions to medications in youth compared to adults. For example, children and adolescents have more active tissue growth, adolescents have higher levels of reproductive hormones, and youth have different liver compositions to name a few pharmacokinetic differences that could affect the action of medications (Correll, Kratochvil, & March, 2011). The lack of information about the effects, dosages, and safety of some psychotropic medications has led the pediatric population to be considered therapeutic orphans (Welisch & Altamirano-Diaz, 2015). The increases in psychotropic prescription practices despite a lack of corresponding body of empirical research underscore the critical need to closely examine mental health services among vulnerable populations.

Antidepressant medications. Selective serotonin reuptake inhibitors (SSRIs) have replaced tricyclic antidepressants as the most commonly prescribed antidepressant in children and adolescents due to their reduced side-effects and superior efficacy (Mitchell, Davies, Cassesse, & Curran, 2014). The SSRI fluoxetine (Prozac) is the only antidepressant medication to be approved by the United States Food and Drug Administration for the treatment of depression in children and adolescents due to its efficacy and tolerable levels of side-effects

(Birmaher, Brent &, AACAP Work Group on Quality Issues, 2007). SSRIs are also approved to treat obsessive compulsive disorder (OCD) and are used to treat other anxiety disorders (Kodish, Rockhill, Ryan, & Varley, 2011).

Method of action. SSRIs are beneficial because they selectively target serotonin and block its reuptake resulting in increased levels of interneuron serotonin. It is hypothesized that the SSRI fluoxetine has better outcomes than other SSRIs (e.g., sertraline, fluvoxamine) due to the longer half-life of the medication in the body. This property makes fluoxetine less sensitive to missed doses than other medications, which are removed more rapidly from the body (Birmaher et al., 2007).

Therapeutic effects. Antidepressants have an established body of support for use in children and adolescents. A meta-analysis of 29 randomized, double-blind, placebo-controlled studies examined the efficacy of antidepressants for short-term (mean=8.7 weeks) therapy (Tsapakis et al., 2008). The studies in this analysis included comparisons of tricyclic antidepressant, SSRIs, and other antidepressants, such as a monoamine oxidase inhibitor (MAOI). This study measured the response ratio of the medications. The response ratio is the portion of participants with significant improvements in the experimental condition to participants with significant improvement in the control condition. Significant improvements were defined as a significant reduction in symptoms as measured by the standardized ratings from each study. The overall response ratio for antidepressants was 1.22 with a slight superiority for SSRI's, 1.23, compared to tricyclic antidepressants, 1.15. Fluoxetine had a significantly higher response ratio, 1.42, than other SSRIs. Notably, antidepressant medications had larger effects for older children indicating that age may be a significant factor that influences responses to the pharmacological treatment of depression.

The Treatment for Adolescents with Depression Study (TADS; March et al., 2004), included in the Tsapakis and colleagues (2008) meta-analysis, is one of the largest randomized controlled trials of antidepressant medication in children and adolescents. This study included 439 youth randomized to receive fluoxetine, cognitive behavioral therapy, combined fluoxetine and cognitive behavioral therapy, or a placebo control. The group that received the combined treatment showed a response ratio of 2.04, the fluoxetine group had a response ratio of 1.74, and the group that received cognitive behavioral therapy alone had a response ratio of 1.24. These results are consistent with other research supporting the use of fluoxetine for depression in adolescents and also underscore the positive effects that combined medication and psychological treatments can have.

Side-effects. Antidepressants are generally well-tolerated by children and adolescents, though the risk of side-effects is increased for children and adolescents compared to adults (Correll et al., 2011). The side-effects for antidepressants include the onset or worsening of anxiety, depression, and irritability, as well as agitation, panic attacks, sleep disturbances, aggression, anger, impulsivity, and hyperactivity (Kubiszyn, 2005). These side-effects are generally dose dependent and can usually be remediated with dosage changes (Birmaher et al., 2007). One of the most notable side-effects of antidepressant medication reflected in an FDA black box warning is an increased risk of suicidal ideation. Children and adolescents who do not have suicidal ideation have a two-fold increase in suicidal ideation if they are prescribed antidepressants leading to a need for close monitoring and ongoing assessment (Bridge et al., 2007). The presence of these potentially life-changing side-effects underscores the need to utilize multiple types of treatments, such as wraparound, to reduce the need for these medications.

ADHD medications. There are several types of psychotropic medication treatments available for children with ADHD, including stimulants, and non-stimulants. Stimulant medications such as methylphenidate (e.g., Ritalin and Concerta) and amphetamine combined with dextroamphetamine (i.e., Adderall) are the most common forms of treatment for children with ADHD. Around 75-90% of youth have beneficial behavioral improvements with acceptable levels of side-effects after taking stimulant medication (Vaughan et al. 2012). There is a growing body of literature to investigate the effects of the non-stimulant medications particularly for those that do not respond well to stimulants. Two common non-stimulant medications include the norepinephrine reuptake inhibitor atomoxetine (Strattera) and alpha-2 agonists (e.g., Intuniv) both of which have demonstrated positive effects on ADHD symptoms (Prasad & Steer, 2008; Ruggiero, Clavenna, Reale, Capueauno, Rossi, & Bonati, 2014).

Method of action. Stimulant medications are thought to work by normalizing neurological functioning especially related to executive functions. The specific action of psychostimulant medication in the reduction of ADHD symptoms is unclear, though there is evidence that implicates the role of catecholamines in the prefrontal cortex, a neural area associated with executive functions (Arnsten & Pliszka, 2011). Similar change in catecholamines has also been found with the non-stimulant ADHD medication atomoxetine (Smith et al., 2013) and alpha-2 agonists (Ruggiero et al., 2014). The similar action of multiple types of medication used for ADHD suggest that the reduction in symptoms observed while taking ADHD medications relates to the increase of catecholamines in the prefrontal cortex.

Therapeutic effects. There is empirical evidence that stimulant medications result in a short-term improvement in the symptoms of inattention and hyperactivity. The Multimodal Treatment Study of Children with Attention-Deficit/Hyperactivity Disorder (MTA, 1999),

funded by the National Institute of Mental Health, is one of the largest well-controlled investigations of the effects of stimulant medication for children with ADHD. The MTA study included 579 children who met criteria for ADHD. These children were randomly assigned to one of four treatment groups: intensive medication management, behavioral therapy, combined intensive medication management, or behavioral therapy and community care. While all groups demonstrated an improvement in the core features of ADHD, the intensive medication management and combined approaches showed larger improvements during the initial 14-month study period. This suggests that close monitoring of medication is related to more favorable outcomes for children with ADHD (Jensen et al., 2001). The groups did not generally differ in functional improvements aside from a slight superiority for the combined treatments. Meta-analyses of the effects of stimulant medication have largely echoed the MTA findings of improved core symptomology for ADHD (e.g., Faraone & Buitelaar, 2010; Van der Oord, Prins, Oosterlaan, & Emmelkamp, 2008). Faraone and Buitelaar (2010) analyzed 23 trials of stimulant medication and found reductions in core ADHD symptoms with most effect sizes in the small to medium range.

There is a smaller body of research for the non-stimulant medication atomoxetine, though there is evidence that non-stimulant medications produce similar behavioral improvements as stimulant medications. In a double blind, placebo-controlled study, Michelson and colleagues (2002) found that children receiving atomoxetine had significant improvements in ADHD symptoms across three different raters, a variety of assessment methods, and ADHD subtypes. The findings of the efficacy of atomoxetine have been replicated in subsequent trials by different researchers (e.g., Weiss et al., 2005). Atomoxetine was found to have the similar behavioral improvements as methylphenidate in randomized double-blind comparison trial (Wang et al.,

2007). Alpha-2 agonists have also been rigorously studied and have demonstrated improvements in ADHD symptoms. In a meta-analysis of seven randomized-controlled trials examining guanfacine (Intuniv), Ruggiero and colleagues (2014) found around 60% of children who received guanfacine had clinically significant improvements in ADHD symptoms compared with about one-third in the control group.

Side-effects. Stimulants and atomoxetine general carry similar side-effects. The most common side-effects include appetite suppression, reduce growth rate, and sleep disturbances. Less common side-effects include tics and irritability, which may be more common in younger children (Vaughan, March, & Kratochvil, 2012). These medications also carry an increased risk for cardiac symptoms, though there is not an associated increased mortality related to cardiac complaints in children and adolescents (Gould et al., 2009). Some research indicates that the side-effects (e.g., nausea, sleep disturbances, eating difficulties) of atomoxetine tend to be more severe than with stimulant medications (Wang et al., 2007). The side-effects of alpha-2 agonists generally relate to their antihypertensive nature and include bradycardia (slow heart rate), hypotension, and sedation (Ruggiero et al., 2014).

Antipsychotic medications. Antipsychotic medications can be divided into the first generation, or typical, antipsychotics and the second generation, atypical antipsychotics. The majority of prescriptions of antipsychotic agents are for atypical antipsychotics due to the efficacy and reduced adverse effects when compared to typical antipsychotic medications (Menzin, Boulanger, Friedman, Mackell, & Lloyd, 2014).

Method of action. Antipsychotic medications derive their therapeutic benefit by blocking the neurotransmitter dopamine. In this way, they are considered dopamine antagonists. The specific way in which they interact with dopamine distinguishes typical and the newer atypical

antipsychotic medications (Kapur & Seeman, 2014). A key feature that differentiates typical and atypical antipsychotics is the rate at which dopamine is released from receptor sites in neuronal synapses. Atypical antipsychotic medications are more transient and release more rapidly than typical antipsychotics This action of atypical antipsychotics allows them to maintain their therapeutic effect while greatly minimizing side-effects (Kapur & Seeman, 2014). Additionally, atypical antipsychotics produce little prolactin elevation whereas typical antipsychotics do. Elevated prolactin can cause sexual dysfunction, depression, menstrual irregularities, and decreased bone densities (Maguire, 2001). There are variations in the specific actions of the multiple types of typical and atypical antipsychotics, but the general mechanisms remain similar (Tauscher et al., 2004).

Therapeutic effects. Antipsychotic medications are commonly associated with the treatment of schizophrenia and psychotic symptoms. However, schizophrenia is rare in pediatric populations (American Psychiatric Association, 2013). Consequently, antipsychotic medications are commonly used in youth to treat disorders not associated with schizophrenia (Cooper et al., 2006). In children and adolescents, antipsychotic medications are most often used to treat disruptive behavior and aggression consistent with oppositional defiant disorder, and conduct disorder as well as manic symptoms of bipolar disorder and irritability in autism spectrum disorder (Olfson et al., 2012).

There have been several placebo-controlled studies that have measured the effects of antipsychotic medications on disruptive behaviors and aggression. The atypical antipsychotic risperidone was used in all of these studies. One of the early studies measured the effects of risperidone over a six-week trial period and utilized double-blind, placebo-control methodology with 118 children (Aman et al., 2002). There was a greater reduction in symptoms of conduct

disorder for the children receiving risperidone. There were also improvements in hyperactivity, self-injury, and some improvements in parental reported social competence. A more recent study measured the effects of maintenance of risperidone for severely disruptive behaviors through randomly assigning 527 youth who took risperidone to continue treatment or receive a placebo using double-blind methodology (Reyes, Buitelaar, Toren, Augustyns, & Eerdekens, 2014). They found support that continued risperidone treatment delayed the reoccurrence of symptoms from an average of 37 days with placebo to 119 days with risperidone.

Antipsychotics have demonstrated efficacy reducing the manic symptoms associated with bipolar disorder in children and adolescents. In a review of the research on using antipsychotic medications for bipolar, Correll, Sheridan, and DelBello (2010) identified nine double-blind placebo-control trials utilizing antipsychotic medications with pediatric populations. They found that youth taking antipsychotic medications had significantly reduced symptoms of mania with a moderate effect size (α=0.65). Antipsychotic medications also showed superiority for reducing manic symptoms compared to mood stabilizers, though the antipsychotic medications had greater reports of adverse effects.

Correll and colleagues (2011) reported that there have been five well-designed randomized controlled trials examining antipsychotic medications for use with children and adolescents with autism spectrum disorders. The primary medications used for this population were risperidone and aripiprazole, both atypical antipsychotics. Antipsychotic medication significantly reduced the irritability associated with autism in each of these five studies. The effect sizes were moderate to large for these studies (α=0.5-0.8). There were no improvements in the core symptoms of autism reported in these studies indicating that antipsychotic medications can only be used to treat irritability in children and adolescents with autism.

Side-effects. There are several safety issues with antipsychotic medications. Long-term treatment with antipsychotics carries an increased risk for Tardive Dyskinesia, which is associated with involuntary and repetitive motor movements, as well as other movement disorders. These risks are lower for atypical antipsychotics than traditional antipsychotics. These substances are also associated with psychosis upon withdrawal from medication. Antipsychotics also carry the risk of gastrointestinal distress and weight gain, which may result in the development of other diseases such as diabetes (Spetie & Arnold, 2007).

Polypharmacy and multi-class treatments. There is an increasing, though still underdeveloped, understanding of pharmacological treatments of mental illness in children and adolescents when using one medication, monotherapy. There is even less evidence for using multiple medications (polypharmacy) and taking medications from more than one class concurrently (multi-class treatments) to treat mental health problems (Morden & Goodman, 2012). However, this practice is particularly prevalent in vulnerable populations (Zito et al., 2008). Among medical visits for youth with diagnosed mental illnesses around one-third (32%) involve taking multiple medications. Gender and age appear to influence the rates of polypharmacy with one analysis showing males account for around 71% of the cases of polypharmacy and that older children are more likely to receive multiple medications (Martin et al., 2003). Other analyses reveal that children receiving special education services classified as having an emotional impairment (22%) and autism (24%) have disproportionately high rates of polypharmacy (Sullivan & Sadeh, 2015).

Investigations of polypharmacy and multi-class treatments are largely limited to uncontrolled and retrospective studies (Comer, Olfson, & Mojtabai, 2010). The research on these practices with more strenuous methodologies has a relatively small number of participants and is

focused on adults (e.g., Bauer et al., 2014). The dearth of high-quality research in this area among youth is problematic because there is the lack of safety information about combining medication and the demonstrated increased risk of side-effects especially when combining different classes of medication (Zonfrillo, Penn, & Leonard, 2005). One example of the increased risk comes from a retrospective study that examined short-term use of multiple antipsychotic medications and found no clinical benefit despite an increase in adverse effects (Centorrino et al., 2004).

There are several reasons that a child or adolescent may be prescribed more than one medication. First, the therapeutic response with monotherapy may not be sufficient. An example of this is prescribing multiple antipsychotic medications for youth who do not respond adequately to one, a practice that is increasingly common and without ample research support (Brenner et al., 2014). Second, there may be unacceptable levels of side-effects and a second medication is prescribed to treat the side-effect, such as using a medication for sleep among children taking stimulant medication for ADHD (Owens, Rosen, & Mindell, 2003). Third, complex mental health challenges and comorbidity may result in the need for prescriptions from multiple drug classes.

Ethical considerations for psychopharmacology in vulnerable youth. There are several ethical considerations when treating vulnerable youth with psychotropic medications. Beauchamp and Childress (2008) argue that when treating patients with psychotropic medications it is vital that physicians carefully consider the need for beneficence (i.e., do good) in order to maximize benefits and the need for nonmaleficence (i.e., do no harm). Beauchamp and Childress (2008) also highlight the importance of informed consent for treatment by valuing a respect for autonomy in psychiatric practice. This implies a need for patients to understand

their treatment and have the ability to consent to the treatment in a manner appropriate to their developmental level.

The principles of beneficence and nonmaleficence take the role of balancing therapeutic effects and side-effects of interventions. The American Academy of Child and Adolescent Psychiatry (Walkup & The AACAP Work Group on Quality Issues, 2009) addresses this concern by emphasizing the need to use psychosocial treatments as a first line of treatment when clinically indicated and using the lowest possible dosage and fewest medications possible to effectively manage symptoms. Balancing potential benefits with side-effects is particularly important due to the general paucity of research for psychoactive substances in children compared to in adults, resulting in widespread off-label prescription practices in order to meet the mental health needs of vulnerable youth (Spetie & Arnold, 2007). Similarly, there is a limited knowledge base for using single medications to treat mental health conditions within pediatric populations and even less research support for using multiple medications concurrently (Morden & Goodman, 2012). This raises the need for increased research into the safety and efficacy of polypharmacy practices with vulnerable populations and also highlights the need to investigate the effects of alternative interventions in reducing the need for polypharmacy practices among vulnerable populations.

It is potentially problematic to ensure vulnerable youth's informed consent and autonomy in decision making. Informed consent must be *knowing*, *competent*, and *voluntary* (Jacob, Decker, & Hartshorne, 2010). *Knowing* refers to the concept that individuals must have a clear understanding of what is being consented to and requires that the researcher or practitioner makes an effort to provide such an understanding. *Competent* refers to the ability of an individual to make decisions based on the evidence provided. Competence is particularly important to

consider with vulnerable youth for two reasons. First, children are generally not considered competent to make decisions on their own and secondly children with SED may not have the cognitive capacity due to their impairment to make competent decisions. Spetie and Arnold (2007) highlight that children and adolescents with mental illnesses "have symptoms consisting of changes/impairment in the way they feel, think, and relate to their environments compared to people of similar background who do not have psychiatric illness" (p. 16). In short, some vulnerable youth may have a limited capacity to make judgments and decisions regarding their care, which is potentially inconsistent with ethical guidelines requiring informed consent. Providing youth advocacy in their treatment not only satisfies ethical demands, but also enhances psychotropic medication treatment. Research indicates that youth who actively participate in their medication decisions show reduced symptom severity, improved adherence to medication, and increased satisfaction with services (Delman, Clark, Eisen, & Parker, 2015).

Lastly, informed consent must be voluntary. Voluntary treatment must be provided "in the absence of coercion, duress, misrepresentation, or undue inducement" (Bersoff & Hofer, 1990, p. 951). The voluntary nature of psychotropic intervention is of particular importance for youth in foster care who may not have a stable guardian or stable family placement and therefore may lack someone to advocate for them. In fact, children who have strained relationships with their parents or caregivers, such as those with SED and in foster care, have an increased risk for being considered overmedicated (Zakriski et al., 2005). Further, vulnerable populations may be at particular risk for suggestibility in which the youth may assent to treatment to please the mental health provider or their guardian even when the youth may not want the treatment. In particular, there may be some degree of coercion with psychotropic medication that is used to manage difficult behavior (Yan & Munir, 2004) due to the perception of lack of options or the

stress of attempting to manage child behavior (Carlson, 2010). This is significant not only for ethical reasons but also because youth who feel coerced into taking psychotropic medications are less committed to medication treatment and show low rates of adherence to treatment (Moses, 2011).

Belitz and Bailey (2009) echo the clinical and ethical challenges presented to psychiatrists when they treat vulnerable youth. They emphasize that child populations, and especially those with mental illness, need to be considered as a group distinct from adults and as inherently more vulnerable. For example, they highlight that the adult psychiatric research and accumulated knowledge base does not reliably transfer to child populations and so there is generally less certainty about the effects of medications on children than adults. Further, children are more reliant on others and their environment for support. For children in foster care this is particularly problematic as there is a general lack of consistency of others in their lives.

Conclusions for psychopharmacology with vulnerable youth. There is substantial empirical support for the most common psychotropic medications used to reduce symptoms of mental health disorders among child and adolescent populations, which extend to vulnerable youth. It is important to carefully consider and monitor the side-effects of the medication in order to minimize the potential harm associated with taking psychoactive substances. Unlike the research on monotherapy in pediatric populations, polypharmacy and multi-class treatments do not have well-established research support. This is potentially problematic given the disproportionately high incidence of polypharmacy and multi-class treatments among vulnerable populations. Despite these problems, the rates of prescription medications to treat mental health concerns are increasing. Carlson (2010) describes the reason for this increase as parents and caregivers feeling as though the severity of their child's symptoms are not amenable to other

forms of treatment and may experience feelings of helplessness and hopelessness. This coupled with the relative ease of administering medication and the evidence for improvement in functioning help to explain these high rates of medication usage. Alternative mental health interventions should be examined to reduce the need for polypharmacy especially among vulnerable youth.

Wraparound is one model of service provision that has the potential to address concerns with psychopharmacological treatments of youth. While there has been increased interest in psychotropic medications within wraparound (McGinty et al., 2013), there are very limited empirical investigations of psychotropic medications within wraparound. For example, wraparound may reduce the need for multiple medications by providing psychosocial treatments to address mental health concerns (Bruns et al., 2014). Additionally, the wraparound process can assist physicians by increasing the communication with patients and their families as well as assisting with ongoing assessment to determine the appropriateness and need for psychotropic medications (Harper et al., 2014). However, the rates, patterns, and efficacy of psychotropic medications within wraparound have not yet been studied. Therefore, it is crucial for investigation of the psychotropic treatment practices without wraparound to begin to gain an understanding of this practice within wraparound.

Research Questions and Hypotheses

Question 1. What is the average number of psychotropic medications being taking by vulnerable youth and what are the rates of monotherapy, polypharmacy, multi-class treatments, and individual class treatments at the point of entry into wraparound services?

Hypothesis**:** The rates for participants receiving psychotropic medication were expected to be consistent with previous research on medication rates in vulnerable youth. It should be

noted that there are varying definitions and conceptualizations for vulnerable populations in the literature. The rates that are presented come from the relatively little research available on psychotropic prescription practices among vulnerable populations. The rates presented below and in the results section come from a Sullivan and Sadeh (2015) sample in which participants were identified as having an emotional/behavioral disorder requiring services and supports in the educational setting and the Zito and colleagues (2008) sample were in foster care and had identified psychiatric diagnoses. The Martin and colleagues (2003) sample, used only for multi-class treatment comparisons, included youth in foster care who were eligible for Medicaid. The majority of Martin and colleagues' (2003) sample had identified psychiatric diagnoses but there was incomplete diagnostic data available. Among this research 40% of vulnerable youth receive at least one psychotropic medication (Sullivan & Sadeh, 2015; Zito et al., 2008). The rates of taking more than one medication (i.e., polypharmacy) regardless of medication class have been estimated as 22% of all vulnerable youth (Sullivan & Sadeh, 2015) and account for 55-73% of those taking any medications (Sullivan & Sadeh, 2015; Zito et al., 2008). The rate of multi-class prescriptions for vulnerable youth has also been estimated at 22-52% for those taking any psychotropic medication (Martin et al., 2003; Sullivan & Sadeh, 2015). Among vulnerable youth taking medications, the rates of antidepressant use is estimated at 46-57%, the rates of ADHD medications at 56% and the rates of antipsychotics at 24-53% (Sullivan & Sadeh, 2015; Zito et al., 2008). It is important to compare the prescription rates of vulnerable youth receiving wraparound to vulnerable youth reported in the existing literature in order to establish the similarity or differences between these groups in order to determine if group is at greater risk of receiving psychotropic medications not consistent with best practice. As this area had not yet been studied, it was unclear how youth who receive wraparound compared with other youth in

terms of psychotropic medication use. Establishing the connection between these groups can help place the youth who are receiving wraparound in the context of extent literature and further define the adequacy or merits of psychiatric services that youth receive within wraparound.

Question 2. For those vulnerable youth who are receiving psychotropic medications at the point of entry into wraparound, are there differences in the average number of psychotropic medications prescribed and in psychotropic medication rates (e.g., monotherapy, polypharmacy, multi-class, and individual class treatments) from entry into wraparound services to exit from wraparound services?

Hypothesis: It was hypothesized that there would be a reduction in the number of psychotropic medications that youth take after receiving wraparound care consistent with wraparound policy goals (Washington Revised Code, 2007). Research indicates that vulnerable youth often receive more medications than they require and would benefit from close evaluation and psychosocial treatments (Zakriski et al., 2005), which can be provided through wraparound services. Additionally, a recent study demonstrated that youth with SED in an intensive residential treatment setting successfully reduced the number of medications required (Huefner et al., 2014). While wraparound is not as intensive as residential treatment, wraparound can be expected to show similar trends due to two components of its treatment approach. First, wraparound seeks to advocate for children and adolescents so that they receive appropriate care. Wraparound also provides coordinated care in order to communicate youth's functioning to all service providers allowing for a better understanding of youths' mental health needs. The result of an improvement in coordination, communication, and advocacy is expected to be a close examination of youth's psychopharmacological treatments to ensure that youth receive the fewest medications that they need (McGinty et al., 2013). Further, the mental health

improvements seen in previous studies of wraparound (e.g., Suter & Bruns, 2009) indicate that there should be less of a need for psychotropic medication as mental health improvements are seen. It is critical to measure changes in medications within vulnerable youth due to multiple ethical challenges associated with psychotropic treatment (Beauchamp & Childress, 2008). For example, there is a limited evidence-base for polypharmacy and multi-class treatments and there are multiple side-effects associated with these prescription practices (Morden & Goodman, 2012). Therefore, finding ways to reduce the number of medications that youth receive can help satisfy ethical challenges and potentially improve children's health.

It was hypothesized that the antipsychotic and antidepressant medications would show the greatest reduction in prevalence whereas ADHD medication rates, including both stimulant and non-stimulant medications, were expected to be consistent before and after wraparound care. Antipsychotic medications and antidepressant medications have more severe potential side-effects and so reductions in these medications was expected to be of greater importance to the wraparound team in order to reduce the risk of potentially more adverse side-effect associated with these classes of medication. The side-effects of medication for ADHD are important to be aware of and to monitor, but are not as profound as the risk of suicidal ideation with antidepressants, and the weight gain and movement disorders with antipsychotics (Correll et al., 2011). Further, antipsychotics and antidepressants are used to treat disorders in which there is more severe impairment in functioning. The wraparound approach seeks to target mental health concerns consistent with the team's goals (Bruns et al., 2014). It was expected that the wraparound teams' goals would prioritize addressing more significant impairments in functioning first. Antipsychotic medications are frequently prescribed to treat aggression and severe externalizing behaviors. ADHD medication is also prescribed for externalizing symptoms,

but hyperactivity and inattention are less problematic than overt aggression. Research indicates that in response to treatment, youth with SED show greater reductions in aggression and internalizing symptoms compared with hyperactivity (Huefner et al., 2014) suggesting that treatment of children with SED focuses more on these areas, which may result in decreased need for medications to treat these symptoms.

Question 3. Do the demographic variables of foster care status, gender, county type, or age predict differences in psychotropic medication rates (i.e., monotherapy, polypharmacy, multi-class, individual class treatments) from entry into wraparound services to exit from wraparound services for youth who take psychotropic medications at wraparound intake?

Hypothesis: Research has found that youth in foster care, males, and older youth receive higher rates of psychotropic medications than their peers (Martin et al., 2003; Sullivan & Sadeh, 2015) and youth in urban settings have increased access to psychiatric care (Thomas & Holzer, 2006). It was expected that while these trends may be present for participants as they begin wraparound, they would not predict changes in medication rates after receiving wraparound services. That is, wraparound was expected to function similarly for males, females, youth in foster care, youth not in foster care, youth in urban settings, and youth in rural settings. Wraparound addresses individual needs and provides youth with appropriate services to address these needs while coordinating their overall care (Bruns et al., 2014). The individualized nature of wraparound was anticipated to provide similar results based on gender, foster care status, and type of setting. If similarity based on these demographic characteristics exists, this would support that wraparound is able to provide consistent services for a variety of youth. This is important when considering trends noted in the literature that highlight differential medication rates based on demographic characteristics (Martin et al., 2003; Sullivan & Sadeh, 2015).

There is evidence that increased age of children results in better clinical outcomes with psychopharmacological interventions (Tsapakis et al., 2008) and fewer side-effects (Vaughan et al., 2012). The more favorable outcomes with older children come from physical differences that affect how medication interacts with and is eliminated from the body (Correll et al., 2011). Additionally, older children may be better able to express their wishes regarding medications prior to wraparound treatment whereas younger children may require the support of the wraparound process to express their wishes regarding treatment involving psychotropic medication. Differences in the ability to express wishes regarding medication is important given findings that around two-thirds of youth in wraparound want to discontinue medication (Moses, 2011). The more favorable clinical outcomes reported in the literature for older children (Tsapakis et al., 2008) are anticipated to result in a lower perceived need to reduce the number of medications for older children. It was expected that younger children would show greater reductions in the number of psychotropic medications due to the increased risk of side-effects, lower level of empirical support for psychotropic medications among younger children, and support from the wraparound process to express their views regarding medication usage.

Question 4. Do youth showing decreases in the number of psychotropic medications that they are prescribed have similar improvement in mental health functioning as youth with other patterns of psychotropic medications that they are prescribed?

Hypothesis: It is important to measure mental health functioning to ensure that youth are showing improvements even with changes in medications, and to ensure they are receiving the fewest medications needed to show improvements in order to reduce the risk of side-effects while still realizing improvement in functioning (Walkup & AACAP Workgroup on Quality Issues, 2009). Given this and the trend in wraparound literature for improvement in mental health

functioning (i.e., Sutter & Bruns, 2009), it was hypothesized that youth taking medications when they enter wraparound will demonstrate an improvement in overall mental health functioning even when they have a decrease in the number of medications that they take. Huefner and colleagues (2014) found that youth with SED in intensive residential treatment were able to reduce the rate of medication usage while improving their mental health functioning across a variety of domains. Wraparound is able to coordinate mental health care and include a close examination of psychotropic medication prescriptions (McGinty et al., 2013). This can afford the opportunity to ensure youth are provided the fewest number of medications needed while still demonstrating improvements in mental health functioning. It is critical to examine changes in mental health functioning within the group that shows reduction in psychotropic medications to ensure that this group is not being undertreated for their mental health concerns, but rather is able to have reductions in medications while receiving appropriate mental health services.

Question 5. Are there differences in improvements in mental health functioning for youth who initiate psychotropic medication use during wraparound services compared to youth who do not receive psychotropic medications after controlling for demographic factors and initial level of mental health functioning?

Hypothesis: The American Academy of Child and Adolescent Psychiatry (2001) recommends using the combined approach of psychosocial and psychotropic medication to treat vulnerable youth with mental health concerns. Additionally, the American Psychological Association (2006) highlights the often superior effects of using combined approaches to treating youth. There is no existing research that addresses the use of a combined approach within wraparound. However, it was anticipated that youth who initiate psychotropic medication during wraparound (i.e., a combined psychosocial and medication treatment) would result in greater

improvement in mental health functioning when compared to psychosocial treatments alone consistent with other studies showing similar patterns of superior effects of combined intervention versus only psychosocial interventions (e.g., March et al., 2014; MTA Cooperative Group, 1999). Such a finding would help support the use of wraparound to not only provide psychosocial care to youth, but also provide access to evidence-based treatments (e.g., psychotropic medication, individual therapy), which indicate the use of a combined treatment approach.

Chapter 3: Methods

Participants

Participants were 422 children and adolescents aged 7 through 18 years who were enrolled in wraparound services in the state of Michigan between October 1, 2010 and September 1, 2015. Participants were derived from an ongoing evaluation conducted by the Michigan State University Wraparound Evaluation Project (WEP), which evaluates wraparound services in Michigan. All participants met criteria for SED. The criteria for SED in Michigan are that the youth: (a) has a diagnosable mental, behavioral, or emotional disorder, (b) the disorder has been present for at least one year, and (c) the mental, behavioral or emotional disorder results in "functional impairment that substantially interferes with or limits…functioning in family, school or community activities" (Michigan Mental Health Code Act 258 of 1974). Wraparound services in Michigan are provided by county mental health agencies (N=54) under the direction of the Michigan Department of Health and Human Services Division of Mental Health Services to Children and Families. Wraparound facilitators collect data through the Family Status Report (FSR; see Figure 2 of Appendix B) when youth begin treatment, at three-month intervals, and when the youth exit treatment.

The average age of participants was 12.57 years (SD=2.93) and included 61% males. The participants were 47% White/Caucasians, 34% Black/African American, 9% mixed/multiracial, 7% Hispanic, and 3% other racial groups. There were 51 youth (12%) who lived in foster care when they began wraparound services. Of the youth in foster care, 43 (84%) were in temporary foster care placements, and eight (16%) were in permanent foster care placements. For the purposes of the current analysis, the types of foster care placements were not differentiated due to the small sample sizes. See Table 3 for a summary of the demographic data and a comparison to youth in wraparound in Michigan, all youth in Michigan and youth nationally. The study

sample had more racial/ethnic diversity and an overrepresentation of males and youth in foster care than national and state averages, though closely mirrored youth in wraparound in Michigan. The average CAFAS score at wraparound intake was 105.09 (SD=33.20) indicating significant impairment in mental health functioning.

Table 3. *Comparison of participants to state and national demographic data*

	Study Participants	Youth in wraparound in Michigan*	Youth in Michigan (2010)	Youth in US (2011)
Age Range	7-18 years	7-18 years	7-18 years	6-17 years
Male	61%	62%	51%	51%
Race/Ethnicity				
White	46%	47%	73%	76%
Black	34%	36%	17%	15%
Hispanic	7%	6%	7%†	23%†
Mixed Racial Groups	9%	9%	4%	3%
Other Racial Groups	3%	2%	6%	6%
In Foster Care	14%	12%**	<1%	<1%

* Data from 1288 potential participants from a state-wide sample

** Of available data (9% missing data)

† Hispanic ethnicity considered independently of race

Note: age ranges were selected to resemble study participants for comparison. Youth in wraparound in Michigan range in age from 2-18 (Voris, Thomson, Shepherd, & Carlson, 2014); Data retrieved from Kreider and Lofquist (2014), Michigan Department of Technology, Management and Budget (2010), US Census Bureau (2011), US DHHS Children's Bureau (2014a), US DHHS Children's Bureau (2014b), and US DHHS Children's Bureau (2015).

Inclusion criteria. All participants met criteria for SED and lived in a county that offered wraparound services. Consistent with the WEP protocols (Voris, Thomson, Shepherd, & Carlson, 2014) youth were included in the analysis data set if they had complete initial and exit data, receive services for at least three months to allow for treatment effects, and the youth's wraparound team considered the treatment completed rather than a case of attrition. While data is collected every three months, only the initial and exit time points were used due to large numbers

of missing and incomplete information at time points between the initial and exit data. Cases are considered completed when the wraparound team believes that treatment goals have been met. The treatment goals are individualized and may be related to improved mental health functioning, maintaining or attaining community-based placements, and reduced delinquency. Due to the varied and individualized nature of wraparound, participants were not divided based on the nature of their treatment goals but rather were considered as a group that meet treatment goals.

Attrition. There were 1288 cases with some data available at the initial and exit time points. Six-hundred and sixty of these were cases of attrition and 206 did not have complete data available. The cases of attrition and those with incomplete data were excluded from analyses because there was insufficient data for their inclusion. It is of note that most wraparound research, and social science research for that matter, focuses on children and adolescents that complete treatment. Specifically, the study sample (n=422) represents 33% of these cases, which is virtually identical to the cases included other wraparound research projects using a community sample (e.g., 33% in Anderson et al., 2008). A logistic regression was used to examine if demographic information predicted whether cases were included as participants or excluded due to attrition or incomplete data. The analysis revealed the study participants did not differ from other cases in terms of racial diversity, age, or gender. The participants had statistically lower initial CAFAS scores (mean=105.09, SD=33.20) than the excluded cases (mean=116.27, SD=32.07; b= -.01, p<.001). Excluded cases with initial medication data available (n=570, representing 66% of attrition cases) were prescribed a greater number of medications (mean=1.73, SD=1.62) than study participants (mean=1.37, SD=1.50; t[1028]=3.61, p<.001).

Measures

Medication. The medication data were collected as part of the FSR. The questions about medication included: "Is the child currently prescribed any medications?" and "If YES, how many medications are prescribed?" The Family Status Report then requires a listing of the medications that the youth is currently prescribed. Medications that were not considered psychotropic medications (i.e., birth control, allergy medication) were excluded from the data set. The number of psychotropic medications included the number distinct psychotropic medications prescribed. Polypharmacy was defined as being prescribed more than one psychotropic medication at the same time. Multi-class prescriptions were defined as being prescribed medications from more than one class of medications at the same time. The classes of medications were determined by categories presented by Stahl (2014). See Table 4 for a list of medications within each class. It is important to note that the facilitators acquire this information from sources such as children or caregivers, which may be less reliable sources of information than physicians or medical records. Due to the deidentified nature of the data set, it was not possible to independently verify the medication information provided by facilitators.

Table 4. *Medication classifications for youth in wraparound services*

Class	Medication Name	**Class**	Medication Name
Antidepressants		**Antipsychotics**	
	amitriptyline		aripiprazole
	bupropion		asenapine
	citalopram		chlorpromazine
	clomipramine		clozapine
	desvenlafaxine		fluphenazine
	doxepin		haloperidol
	duloxetine		lurasidone
	escitalopram		Molindone
	fluvoxamine		olanzapine
	fluoxetine		paliperidone
	fluoxetine and olanzapine		perphenazine
	imipramine		quetiapine
	mirtazapine		risperidone

Table 4 (cont'd)

paroxetine	thioridazine
sertraline	thiothixene
trazodone	ziprasidone
venlafaxine	
vortioxetine	**Anxiolytics**
	alprazolam
Medications for ADHD	buspirone
Stimulants	clonazepam
amphetamine and dextroamphetamine	
clonidine	clorazepate
dexmethylphenidate	diazepam
dextroamphetamine	hydroxyzine
guanfacine	lorazepam
lisdexamfetamine	prazosin
methylphenidate	propranolol
Non-stimulants	**Anticholinergics**
atomoxetine	benztropine
clonidine	
guanfacine	**Anticonvulsants**
	carbamazepine
Mood stabilizers	clobazam
divalproex sodium	gabapentin
lamotrigine	levetiracetam
lithium	oxcarbazepine
valproic acid	rufinamide
	tiagabine
Sedative hypnotics	topiramate
eszopiclone	zonisamide
ramelteon	
zolpidem	

Categories based on Stahl, 2014.

The Child and Adolescent Functional Assessment Scale (CAFAS; Hodges, 1990). The CAFAS is a standardized, validated assessment that is used to monitor youth's mental health functioning. The CAFAS is a widely used assessment tool that facilitates that measurement of changes in functioning for youth in wraparound and other public mental health systems (e.g., Cox et al., 2010; Koch & Brunk, 1998; Massey, Kershaw, Armstrong, Shepard, & Wu, 1998). The CAFAS provides a total functional score that ranges from 0 to 240. Higher CAFAS ratings

indicate more impaired functioning and a reduction of 20 points indicates clinically significant improvements in mental health functioning. The CAFAS also provides eight subscales intended to measure the relative level of functioning in each domain (Thinking, Substance Use, Self-harm, Moods/Emotions, Community, Home, School/Work, and Behavior Toward Others). Each subscale has ratings ranging from 0-30, with 0 indicating no/minimal impairment, 10 indicating mild impairment, 20 indicating moderate impairment, and 30 indicating severe impairment. The reliability estimates of the CAFAS total score range from r=.84-.96 (Hodges & Wong 1996). Clinician interrater reliability ranges from r=.74-99 and one-week test-retest reliability is reported as r=.95 (Hodges, 1995; Hodges & Wong, 1996). The CAFAS was found to have concurrent validity between r=.51-.56 with the Child Behavior Checklist (CBCL; Achenbach, 1991) and between r=.59-.63 with the Child Assessment Schedule (CAS; Hodges, Kline, Stern, Cytryn, & McKnew, 1982). Scores on the CAFAS significantly predict residential placement (Roy, Roberts, Vernberg, & Randall, 2008) and services received (Hodges & Wong, 1997). The CAFAS also shows similar trends in measuring changes in functioning as the CBCL and the Behavioral and Emotional Rating Scale (BERS; Epstein, 1999) in wraparound populations (Anderson et al., 2008).

Demographic variables. Demographic information regarding gender, sex, age, and foster care status were retrieved from the demographic sections of the initial FSR. The county in which services was provided was determined as a part of each participant's identification number. Type of county (urban or rural), was operationalized based on criteria established by the Michigan Department of Health and Human Services, previously the Michigan Department of Community Health (2012), using United States Census Bureau information from 2010. The criteria for being an urban county was that the county had at least one core urban area with a

population of at least 50,000 and included adjacent areas that have significant social and economic interchange with the urban area. Counties that were not urban were considered rural according to the Michigan Department of Community Health (2012). See Table 5 for listing of all urban and rural counties in Michigan.

Table 5. *Listing of urban and rural counties in Michigan*

Urban Counties	Rural Counties		
Bay	Alcona	Gratiot	Montcalm
Berrien	Alger	Hillsdale	Montmorency
Calhoun	Allegan	Houghton	Newaygo
Clinton	Alpena	Huron	Oceana
Eaton	Antrim	Ionia	Ogemaw
Genesee	Arenac	Iosco	Ontonagon
Ingham	Baraga	Iron	Osceola
Jackson	Barry	Isabella	Oscoda
Kalamazoo	Benzie	Kalkaska	Otsego
Kent	Branch	Keweenaw	Presque Isle
Lapeer	Cass	Lake	Roscommon
Livingston	Charlevoix	Leelanau	Sanilac
Macomb	Cheboygan	Lenawee	Schoolcraft
Midland	Chippewa	Livingston	Shiawassee
Monroe	Clare	Luce	St. Joseph
Muskegon	Crawford	Mackinac	Tuscola
Oakland	Delta	Manistee	Van Buren
Ottawa	Dickinson	Marquette	Wexford
Saginaw	Emmet	Mason	
St. Clair	Gladwin	Mecosta	
Washtenaw	Gogebic	Menominee	
Wayne	Grand Traverse	Missaukee	

Procedures

Wraparound process in Michigan. Wraparound is an individualized treatment process and as such there is not a predetermined set of services provided to youth. The youth had access to at least 29 different types of services in the state of Michigan (see Appendix B for the Family Status report which includes services provided). The most common types of services participants

received were intensive home-based therapy (53%), psychiatric services (47%), and outpatient therapy (39%). Services provided were determined by the wraparound team's assessment of the child's needs and the child and family's wishes. The average number of types of team members (e.g., immediate family, extended family, school personnel, therapist) on wraparound teams was 5.64 with a standard deviation of 2.14. The duration of services was also individualized according to the youth's progress and treatment goals. The average time in services for participants was 11.00 months (SD= 5.76 months) and ranged from 3 months to 46 months.

Institutional Review Board. The analysis data set was determined to be non-human subjects research by the Michigan State University Institutional Review Board because the data were not obtained by WEP's direct interaction with participants and the data were deidentified.

Data collection. Data were collected through REDCap, a secure online data management system. The Michigan State University's Biomedical Research Informatics Core (BRIC) managed the REDCap system for this evaluation project. The data were collected through the FSR which was created through a partnership between the Michigan Department of Health and Human Services and WEP and includes information about children's mental health functioning and the interventions they receive, including psychopharmacological interventions. Facilitators were responsible for collecting this information from the wraparound team and the child and submitting this information to the REDCap system for funding and evaluation purposes. The facilitators typically had a background in social work. The facilitator completed the FSR based on team member feedback and data gathering.

Facilitators received reminder emails through the REDCap system to increase the fidelity of data entry. They received a reminder email seven days prior to the next quarterly FSR due date, and then 10, 20, and 30 days after the due date if the information was not yet entered into

REDCap. Once an FSR was 20 and 30 days overdue the facilitator's supervisor received a reminder email. If an FSR was 30 days overdue the facilitator's program administrator also received a reminder email.

Data analysis. See Table 6 for an overview of the data analytic approach for each research question.

Table 6. *Summary of data analyses*

	Sample	Model type	Independent variable (s)	Dependent variable (s)	Model tested
Question 1 (Prevalence of psychotropic prescriptions)	All participants	Descriptive statistics	n/a	n/a	n/a
Question 2 (Overall changes in number of medications)	Youth taking medications at intake	Generalized Linear Mixed Model with Poisson distribution	Time (initial, exit)	Number of medications	Main effect of time on number of medication
Question 2 (Changes in monotherapy, polypharmacy multi-class treatments, individual class treatments)	Youth taking medications at intake	Generalized Linear Mixed Model	Time (initial, exit)	Presence of medication within class/type, medication pattern (mono, poly, multi-class)	Initial versus exit frequency of medication
Question 3 (Predicting changes in rate of medication)	Youth taking medications at intake	Generalized Linear Mixed Model	Time, Foster Status, Gender, Age, Urban, Age^2, Interaction between time and each other independent variable	Presence of medication within class/type, medication pattern (mono, poly, multi-class)	Interaction between time and: Foster, Gender, Age, Age^2, Urban

Table 6 (cont'd)

Question 4 (Mental health functioning and medication patterns)	All participants	Regression	Medication Pattern *Covariates:* Initial CAFAS score, Foster Status, Gender, Age, Urban, Age^2	Change in CAFAS Scores	Main effect of medication patterns
Question 5 (Combined versus wraparound alone)	Youth who did not take medication and youth who initiated medication during wraparound	Regression	Initiated medication *Covariates:* Initial CAFAS score, Foster Status, Gender, Age, Urban, Age^2	Change in CAFAS Score	Main effect of initiating medication

Research question 1 (prevalence of psychotropic prescription). Descriptive statistics were used to describe the frequency of psychotropic prescriptions for youth initiating wraparound services. The frequency of any psychotropic medication was presented along with the average number of medications, frequency of monotherapy, polypharmacy and multi-class treatments for those prescribed psychotropic medications at onset of wraparound. Additionally, the frequencies of each class of medication were presented.

Research question 2 (changes in number of psychotropic medications and medication rates for youth taking psychotropic medication at entry). To determine change in the overall number of medications a generalized linear mixed model with a Poisson distribution was used to determine if there were overall changes in the number of medications youth were prescribed at the initial and exit time points of wraparound. The distribution of the number of medications followed a Poisson distribution where the mean is similar to the standard deviation, the lower limit is zero, and there are only integer values. The independent variable for this model was the

time period and the outcome was the number of psychotropic medications prescribed. The assumption of independence of observations would be violated with a typical Poisson regression and so a generalized linear mixed model was used to account for the repeated measurements (i.e., initial and exit time points) within each participant. Generalized linear mixed models were used to examine changes in the rates of medications from the initial to exit time points. Additionally, generalized linear mixed models were used for research question 2 for ease of comparison with research question 3.The independent variable for each regression was a binary variable for time (0=initial, 1=exit) and the outcome was a binary variable to describe the presence or absence, (0=absence, 1=presence) of each prescription practice (monotherapy, polypharmacy, multi-class treatment) and medication class. Examining the effects of time from the initial to exit time points were used rather than using a change score due to the binary nature of the variables and the difficulty calculating meaningful change scores for binary variables. Stimulants and non-stimulants were also examined through regression models given the attention to these subtypes of ADHD medications in the literature (i.e., APA, 2006; Vaughan et al., 2012). A separate model was used for each prescription practice and type of medication. The assumption of independence of observations would be violated with a typical logistic regression and so a generalized linear mixed model was used to account for the repeated measurements (i.e., initial and exit time points) within each participant.

A Benjamini Hochberg correction was used for all p-values in research questions 2 and 3. All p-values were included in this correction to account for the similarity between dependent variables and models tested in research questions 2 and 3 (Schochet, 2008). This correction uses a step-wise procedure to control for the false discovery rate (FDR). The FDR is the proportion of null hypotheses that are erroneously rejected. The FDR is contrasted with corrections that use the

family-wise error rate (FWER), which focuses on reducing the likelihood that one hypothesis will be erroneously accepted. Using an FDR correction, such as the Benjamini Hochberg, has more power to detect differences than an FWER approach (i.e., Holm-Bonferroni correction), though has a higher likelihood of false positive results. Schochet (2008) argues that FDR corrections, such as the Benjamini Hochberg, are more appropriate than FWER corrections for exploratory analyses that are used to identify trends in the data and guide future research. As the current study is exploratory in nature, the Benjamini Hochberg correction, an FDR correction, was selected. It should also be noted that a power analyses revealed sufficient sample size to detect differences in the current study.

The Poisson model for research question 2 was:

$Y = \beta_0 + \beta_1(time) + U_{0i} + \epsilon$

A logarithmic link function as used to model the relationship between time and number.

U_{0i} is included to account for the repeated measurements within child.

of medications.

The logistic regression models were:

$Y = \beta_0 + \beta_1(time) + U_{0i} + \epsilon$

A logarithmic link function as used to model the relationship between time and medication rates

Research question 3 (predictors of changes in medication). Similar models as research question 2 were used for research question 3. The primary differences were the inclusion of demographic variables (foster, gender, age, urban and age^2) as well as interactions variables between each demographic variable and time. Age^2 was included after visual inspection of the data revealed potential non-linear effects of age. The primary variables of interest in this model

were the interactions between the demographic variables and the time variable to measure changes in the outcome variable over time based on each demographic variable. These interaction terms showed the relationship between the demographic variables and time on the outcome variable of interest.

The Poisson model for research question 2 was:

$Y= \beta_0 + \beta_1(time) + \beta_2(foster) + \beta_3(gender) + \beta_4(age)\ \beta_5(urban) + \beta_6(age^2) + \beta_7(foster\ x\ time) + \beta_8(gender\ x\ time) + \beta_9(age\ x\ time)\ \beta_{10}(urban\ x\ time) + \beta_{11}(age^2\ x\ time) + U_{0i} + \epsilon$

A logarithmic link function as used to model the relationship between time and number

The logistic regression models were:

$Y= \beta_0 + \beta_1(time) + \beta_2(foster) + \beta_3(gender) + \beta_4(age)\ \beta_5(urban) + \beta_6(age^2) + \beta_7(foster\ x\ time) + \beta_8(gender\ x\ time) + \beta_9(age\ x\ time)\ \beta_{10}(urban\ x\ time) + \beta_{11}(age^2\ x\ time) + U_{0i} + \epsilon$

A logarithmic link function as used to model the relationship between time and medication rates

Research question 4 (changes in mental health functioning and psychotropic medication patterns). For this analysis youth were grouped into four patterns of medications prescriptions. The first was the group that showed a decrease in the number of medications, the second group were those that showed an increase in the number of medications (I), the third were youth who took no medications at the intake or exit time periods (N), and the last group were those that had the same, non-zero number of medications at the intake and exit time points (S). There were three dummy coded variables created to distinguish between the medication patterns (I, N and S). The decrease in medication group was the comparison group and coded such that the three dummy coded variables were zeros. Demographic variables were entered as covariates to account for potential variance according to these factors. Age^2 was included as a predictor

variable to account for potential non-linear effects of age. Initial CAFAS scores were entered as a covariate. The dependent measure for this analysis was the change in CAFAS scores. This model compared the changes in CAFAS scores for each medication pattern to those that have a decrease in the number of medications. These contrasts were specified to determine if youth who had reductions the number of psychotropic medications had a comparable change in mental health functioning to other patterns of prescription practices. A Benjamini Hochberg correction was used for p-values in questions 4 and 5. All participants were used for this analysis. The regression model used to describe these data was:

$Y = \beta_0 + \beta_1(I) + \beta_2(N) + \beta_3(S) + \beta_4(foster) + \beta_5(gender) + \beta_6(age) + \beta_7(urban) + \beta_8(age^2)\ \beta_9(initial\ CAFAS\ score) + \epsilon$

Research question 5 (wraparound services with and without psychotropic medications). Research question 5 was examined using a regression analysis. The regression model used in this analysis was very similar to research question 4 with the exception of the primary independent variable. The independent variable for research question 5 was a medication pattern variable to distinguish between youth who did not receive medication to youth who initiated medication during wraparound. Demographic variables were entered as covariates to account for variance according to these variables, including age^2. The regression model used to describe this data was

$Y = \beta_0 + \beta_1(I) + \beta_2(N) + \beta_3(S) + \beta_4(foster) + \beta_5(gender) + \beta_6(age) + \beta_7(urban) + \beta_8(age^2)\ \beta_9(initial\ CAFAS\ score) + \epsilon$

Chapter 4: Results

Research Question 1

Research question 1 addresses the average number of medications taken at the point of entry into wraparound and the prevalence rates of being prescribed one medication, multiple medications, multi-class, and individual class treatments. Table 7 presents the prevalence of participants taking medications at wraparound intake. While the focus on this study is primarily on youth taking psychotropic medication when they entered wraparound services, it is important to provide overall prevalence rates for psychotropic medications for this sample given that this is the first study to investigate medication rates within wraparound. Analyses reveal that of the total 422 participants, 57.6% of youth were taking at least one psychotropic medication when they entered wraparound care, which included 16.4% that took one medication and 41.2% that took more than one medication, polypharmacy. Additionally, 31% of all participants were prescribed psychotropic medications from more than one class, multi-class treatments. The overall prevalence of antipsychotic medications was 34%, antidepressant medications were 25%, and medications for ADHD was 38%, which included an overall rate of 27% for stimulants and 19% for non-stimulant ADHD treatments.

Table 7. *Prevalence of psychotropic medication use among vulnerable youth before receiving wraparound care*

	Overall percentages in current study (n=422)	Percentages among youth taking any psychotropic medication in current study (n=243)	Percentages among vulnerable youth reported in literature
Any psychotropic medication	57.6%†	--	35-40%*
Monotherapy	16.4%	28%	27-45%**
Polypharmacy	41.2%	72%	55-73%**
Multi-class treatments	31%	61%†	22-52%**
Antipsychotic	34%	59%	24-53%**
Antidepressant	25%	44%	46-57%**

Table 7 (cont'd)

ADHD Medication	38%	66%	56%**
Stimulants for ADHD	27%	48%	51-56%**
Non-stimulants for ADHD	19%	34%†	10%**
Anxiolytics	3%	5%	3-5%**
Anticonvulsants	3%	5%†	26-28%**
Mood stabilizer	10%	18%†	2-9%**
Anticholinergics	2%	3%	n/a

*Overall percentage; ** Among youth taking at least one medication; †considered outside ranges established in literature.
Martin et al., 2003 (youth with Medicaid in foster care, incomplete diagnostic information available); Sullivan & Sadeh, 2015 (youth with emotional/behavioral disorder); Zito et al., 2008 (youth in foster care with psychiatric diagnoses)

The following prevalence rates describe psychotropic medication usage among youth who entered wraparound already prescribed at least one psychotropic medication. Note that the rates in the previous paragraph describe the rates for all youth in wraparound whereas the following rates are for the 243 youth who were reported taking psychotropic medication at the onset of wraparound services. Among these youth, 28% took one medication (i.e., monotherapy). A total of 72% took more than one medication (average=2.38 medications, SD=1.22), polypharmacy, and 61% took medications from more than one class, multi-class treatments. With regard to specific medication classes, 59% of youth taking medications took antipsychotic medications (98% of which were for atypical antipsychotics), 44% took antidepressant medications (70% of which were for SSRIs), and 66% took medications for ADHD. The prevalence of stimulants for ADHD (e.g., methylphenidate) among the 243 youth was 48% and for non-stimulants for ADHD (e.g., guanfacine, atomoxetine) was 34%. Of note, 24% of youth taking medication for ADHD took both stimulants and non-stimulants.

Research Question 2

Change in number of psychotropic medications. A generalized linear mixed model (See Table 8) was used to measure changes in the number of medication from the initial to the

exit time periods for those taking medication at wraparound intake. There was a non-significant (beta=-.12, p'=0.40) reduction in the average number of psychotropic medications youth were prescribed from the intake (M=2.38; SD=1.23) to the exit time-points (M=2.11; SD=1.49). This 0.27 reduction represents an 11% decline. When considering all 422 participants, the rate of medication usage among all youth wraparound participants stayed virtually the same with some youth on medications at intake no longer receiving prescriptions and some youth not on medication at intake receiving medications (intake mean=1.37, SD=1.50; exit mean= 1.40, SD=1.49).

Table 8. *Results of model for change in number of psychotropic medications*

	Beta	BSE	p-value	corrected p-value (p')	effect size
Intercept	0.74	0.05	<.001		
Time	-0.12	0.06	0.04	0.40	0.21

Changes in rates of medications. Table 9 presents the rates of psychotropic medications at the intake and exit time periods.

Table 9. *Medication rates at intake and exit from wraparound for youth taking medication at entry into wraparound*

	Initial	Exit
Monotherapy	28%	17%
Polypharmacy	72%	65%
Multi-class treatments	61%	57%
Antipsychotic	59%	50%
Antidepressant	44%	37%
ADHD Medication	66%	58%
Stimulants for ADHD	48%	44%
Non-stimulants for ADHD	34%	30%

Separate generalized linear mixed models presented in Table 10 were used to determine the changes in rates in those taking medications at onset of wraparound services. This includes rates of monotherapy, polypharmacy, multi-class treatments, antidepressants, antipsychotics, ADHD medications, stimulant medications and non-stimulant medications.

Table 10. *Results of model for change in rates of psychotropic medications*

	Beta	BSE	p-value	corrected p-value (p')	odds ratio
Monotherapy					
Intercept	-0.97	0.16	<.001		
Time	-0.67	0.23	0.003	0.16	0.51
Polypharmacy					
Intercept	1	0.17	<.001		
Time	-0.35	0.21	0.09	0.64	0.70
Multi-class treatments					
Intercept	0.51	0.16	0.001		
Time	-0.21	0.2	0.28	0.87	0.81
Antidepressant					
Intercept	-0.28	0.16	0.07		
Time	-0.31	0.2	0.12	0.73	0.73
Antipsychotic					
Intercept	0.44	0.17	0.009		
Time	-0.46	0.2	0.02	0.24	0.63
ADHD Medication					
Intercept	0.72	0.16	<.001		
Time	-0.35	0.2	0.08	0.61	0.70
Stimulants for ADHD					
Intercept	-0.1	0.16	0.54		
Time	-0.17	0.2	0.38	0.87	0.84
Non-stimulants for ADHD					
Intercept	-0.77	0.17	<.001		
Time	-0.2	0.21	0.34	0.87	1.22

There were non-significant, decreases from intake into wraparound to exit from wraparound for rates of monotherapy (28% to 17%, beta=-.67, p'=0.16), polypharmacy (72% to 65%, beta=-.35, p'=0.64), multi-class treatment (61% to 57%, beta=-0.21, p'=0.87), antidepressant medications (44% to 37%, beta=-.31, p'=0.73), antipsychotic medications (59% to 50%, beta=-.46, p'=0.24), ADHD medications (66% to 58%, beta=-.35, p'=0.61), stimulants (48% to 44%, beta=-.17, p'=0.87), and non-stimulants (34% to 30%, beta=-.20, p'=0.87).

Research Question 3

Predictors of change in number of psychotropic medications. A generalized linear mixed model was used to determine if demographic variables predicted changes in the number of psychotropic medications youth who entered wraparound taking medication received during wraparound. None of the demographic variables predicted changes in the number of psychotropic medications (see Table 11).

Table 11. *Results of model for predictors of change in number of psychotropic medication*

Term	Beta	BSE	p-value	corrected p-value (p')
Intercept	0.81	0.19	<.001	
Time	0.05	0.25	0.86	0.95
Foster care	-0.10	0.18	0.59	0.94
Male	0.13	0.10	0.19	0.81
Urban	0.03	0.18	0.88	0.95
Age	0.01	0.02	0.77	0.94
Age2	-0.01	0.01	0.19	0.81
Time*Foster care	-0.16	0.25	0.53	0.94
Time*Male	-0.14	0.13	0.32	0.87
Time*Urban	0.03	0.18	0.88	0.95
Time*Age	-0.02	0.02	0.33	0.87
Time*Age2	0.003	0.01	0.67	0.94

Predictors of changes in rates of medication. Generalized linear mixed models presented in Table 12 were used to measure demographic variables ability to predict changes in rates of monotherapy, polypharmacy, multi-class treatments, antidepressants, antipsychotics, ADHD medications, stimulants and non-stimulants among youth entering wraparound taking psychotropic medication. None of the demographic variables predicted changes in any of these regressions. Gender significantly predicted rates of ADHD medication such that males were more likely to receive an ADHD medication at the initial time point (77% vs. 44%; beta=1.42, p'=.01, odds ratio=4.14) though gender did not predict changes in rates of medication for ADHD

(beta=-.35, p'=0.90, odds ratio=.70) suggesting that males continued to receive higher rates of medication for ADHD (67% vs. 41%).

Table 12. *Results of model for predictors of change in prevalence medication type*

Medication Type	Term	Beta	BSE	p-value	corrected p-value (p')	odds ratio
Antidepressants	Intercept	-0.18	0.74	0.81		
	Time	-0.54	0.94	0.56	0.94	0.58
	Foster care	0.60	0.67	0.37	0.87	1.82
	Male	-0.82	0.36	0.02	0.24	0.44
	Urban	0.80	0.74	0.28	0.87	2.23
	Age	0.18	0.07	0.005	0.18	1.20
	Age^2	-0.05	0.02	0.23	0.87	0.95
	Time*Foster care	-1.14	0.84	0.18	0.81	0.32
	Time*Male	0.17	0.44	0.69	0.94	1.19
	Time*Urban	0.07	0.94	0.94	0.95	1.07
	Time*Age	-0.11	0.08	0.14	0.75	0.90
	Time*Age^2	0.02	0.03	0.41	0.90	1.02
Antipsychotics	Intercept	-0.09	0.71	0.9		
	Time	0.24	0.84	0.77	0.94	1.27
	Foster care	-1.22	0.66	0.06	0.49	0.30
	Male	-0.24	0.38	0.52	0.94	0.79
	Urban	1.04	0.68	0.13	0.73	2.83
	Age	-0.02	0.07	0.78	0.94	0.98
	Age^2	-0.02	0.02	0.35	0.87	0.98
	Time*Foster care	0.03	0.90	0.94	0.95	1.03
	Time*Male	0.03	0.45	0.94	0.95	1.03
	Time*Urban	-0.77	0.81	0.35	0.87	0.46
	Time*Age	-0.02	0.08	0.85	0.95	0.98
	Time*Age^2	0.002	0.03	0.94	0.95	1.00
ADHD medication	Intercept	0.08	0.72	0.91		
	Time	0.63	0.93	0.50	0.94	1.88
	Foster care	0.75	0.75	0.31	0.87	2.12
	Male	1.42	0.35	<.001	0.01	4.14
	Urban	-0.43	0.71	0.55	0.94	0.65
	Age	-0.16	0.07	0.01	0.21	0.85
	Age^2	0.02	0.02	0.42	0.90	1.02
	Time*Foster care	-0.44	0.92	0.64	0.94	0.64
	Time*Male	-0.35	0.44	0.43	0.90	0.70
	Time*Urban	-0.70	0.93	0.45	0.91	0.50
	Time*Age	-0.04	0.08	0.65	0.94	0.96
	Time*Age^2	-0.02	0.03	0.60	0.94	0.98
Stimulants	Intercept	-0.06	0.70	0.36		
	Time	-0.33	0.87	0.70	0.94	0.72
	Foster care	0.57	0.65	0.39	0.87	1.77

Table 12 (cont'd)	Male	0.94	0.36	0.01	0.21	2.56
	Urban	-0.29	0.68	0.67	0.94	0.75
	Age	-0.14	0.06	0.02	0.24	0.87
	Age2	0.02	0.02	0.39	0.87	1.02
	Time*Foster care	-0.17	0.81	0.83	0.94	0.84
	Time*Male	-0.11	0.45	0.81	0.94	0.90
	Time*Urban	0.20	0.84	0.81	0.94	1.22
	Time*Age	-0.02	0.08	0.81	0.94	0.98
	Time*Age^2	0.006	0.03	0.82	0.94	1.01
Non Stimulants	Intercept	-0.72	0.72	0.32		
	Time	0.56	0.88	0.53	0.94	1.75
	Foster care	-0.21	0.69	0.76	0.94	0.81
	Male	0.93	0.4	0.02	0.24	2.53
	Urban	-0.49	0.68	0.47	0.91	0.61
	Age	-0.11	0.07	0.11	0.73	0.90
	Age2	-0.03	0.02	0.19	0.81	0.97
	Time*Foster care	0.09	0.86	0.92	0.95	1.09
	Time*Male	0.18	0.53	0.74	0.94	1.20
	Time*Urban	-0.93	0.84	0.27	0.87	0.39
	Time*Age	-0.14	0.09	0.13	0.73	0.87
	Time*Age^2	-0.02	0.03	0.59	0.94	0.98

Research Question 4

The fourth research question compared the changes in mental health functioning to patterns of medication usage to determine if youth who had decreases in medication had similar changes in mental health functioning to youth with other medication patterns. The regression analyses included demographic characteristics and the initial CAFAS scores as covariates to account for potential variance attributable to these factors (see Table 13).

Table 13. *Results of regression for mental health functioning and medication patterns*

	B	BSE	ß	t	Partial Correlation	p-value	Corrected p-value (p')
Intercept	-8.98	25.24		-.36		0.72	
Increased medication	6.42	4.11	0.07	1.56	0.08	0.12	0.21
No medication	-4.93	4.01	-0.06	-1.23	-0.06	0.22	0.32
No change in medication	10.06	4.20	0.12	2.39	0.12	0.02	0.053
Foster Care	-6.90	4.51	-0.06	-1.53	-0.08	0.13	0.21

Table 13 (cont'd)

Male	3.13	2.97	0.04	1.05	0.05	0.29	0.33
Urban	-2.69	5.77	-0.02	-0.47	-0.02	0.64	0.68
Age	9.87	4.21	0.78	2.35	0.11	0.02	0.053
Age2	-0.41	0.17	-0.78	-2.38	-0.12	0.02	0.053
Initial CAFAS Score	-0.76	0.04	-0.68	-17.26	-0.65	<.001	<.001

B=unstandardized beta coefficient; BSE= standard error; ß=standardized beta coefficient
Note: the dependent variable is such that negative values indicate a reduction in CAFAS scores and an improvement in mental health functioning

Overall, there were 106 youth (25%) who had an increase in the number of medications, 124 youth (29%) never took medications, 101 youth (24%) took the same number of medications, and 91 youth (22%) who had a decrease in the number of medication. The youth who had a decrease in medication had similar changes in CAFAS scores (mean=-40.55, SD=40.51) as youth who had increases in medications (mean=-38.4, SD=36.57; ß=.07, p'=.21), youth who did not take medications (mean=-38.31, SD=37.37; ß=-.06, p'=0.053), and youth who took the same number of medications (mean=37.03, SD=35.20; ß=.12, p'=.28). Of note participants in all medication patterns had clinically significant reductions in CAFAS scores as indicated by a change greater than or equal to 20 points (see Table 14). No demographic variables significantly predict changes in mental health functioning.

Table 14. *Changes in CAFAS scores by medication pattern*

	Mean CAFAS Change	SD
Never took medications	-38.31*	37.37
Same number of medications	-37.03*	35.2
Increased number of medications	-38.40*	36.57
Decreased number of medications	-40.55*	40.51

*clinically significant improvement in CAFAS score ($\geq$20 reduction in CAFAS scores)

Research Question 5

Research question 5 compared the changes in mental health functioning for the 55 youth (13% of participants) who initiated medications during wraparound (i.e., combined group) to the

124 youth (29% of participants) that did not take medications during wraparound (i.e., psychosocial only wraparound). A regression model was used to compare these groups while controlling for demographic variables as well as the initial level of mental health functioning. The youth in the combined group had a slightly greater change in CAFAS scores (mean=-42.18, SD=37.35) than youth in the wraparound without medication group (mean=-38.31, SD=37.37), however these differences were not significant after controlling for demographic characteristics and initial CAFAS scores (ß=-.07, p'=0.33). Similar to research question 4, no demographic variables predicted changes in mental health functioning (see Table 15).

Table 15. *Regression of CAFAS score changes for wraparound with and without medications*

	B	BSE	ß	t	Partial Correlation	p-value	Corrected p-value (p')
Intercept	-65.19	43.41		-1.50		0.14	
Wraparound without medication	-5.47	4.98	-0.07	-1.10	0.08	0.27	0.33
Foster care	-11.77	6.22	-0.12	-1.89	-0.14	0.06	0.12
Male	0.02	4.56	<.001	0.004	<.001	1.00	1.00
Urban	10.68	10.08	0.07	1.06	0.08	0.29	0.33
Age	15.46	7.03	1.23	2.20	0.17	0.03	0.07
Age2	-0.66	0.29	-1.29	-2.31	-0.17	0.02	0.053
Initial CAFAS Score	-0.74	0.07	-0.65	-10.55	-0.63	<.001	<.001

B=unstandardized beta coefficient; BSE= standard error; ß=standardized beta coefficient
Note: the dependent variable is such that negative values indicate a reduction in CAFAS scores and an improvement in mental health functioning

Chapter 5: Discussion

This is the first research study to examine psychotropic treatment practices among youth with SED within wraparound care despite evidence that the population served by wraparound, vulnerable youth, receive high rates of psychotropic medications and often receive psychotropic medication regimens that are not considered evidence-based (i.e., off-label prescribing, polypharmacy; Brenner et al., 2014). It is critical to examine psychotropic treatment practices for youth in wraparound to determine the adequacy and benefits of the psychiatric services youth in wraparound receive especially in light of potentially serious side-effects of psychotropic medications and the opportunity within the wraparound service delivery process to address concerns (e.g., safety, efficacy, treatment adherence) associated with psychotropic medications.

Overall, more than half of participants were prescribed a psychotropic medication at when they entered wraparound (56%), which is higher than rates reported for similar populations in the literature (35-40%; Sullivan & Sadeh, 2015; Zito et al., 2008). There are varying definitions for SED throughout the literature and so it is important to note that the youth from the Sullivan and Sadeh (2015) sample were identified as having an emotional/behavioral disorder requiring services and supports in the educational setting and the Zito and colleagues (2008) sample were in foster care and had identified psychiatric diagnoses. There were similar rates in the current study among youth receiving monotherapy compared to other research (28% vs. 27-45% Sullivan & Sadeh, 2015; Zito et al., 2008). Further, a majority of youth who were prescribed psychotropic medications were prescribed antipsychotics (59%) and medications for ADHD (66%) while just under half (44%) received antidepressants, all of which are similar to rates reported in previous studies (see Table 7). Non-stimulants (e.g., guanfacine, atomoxetine) for ADHD were substantially elevated in the current study compared to previous reports (34%

vs. 10%). These differences may be due to the 24% of participants who received both stimulants (e.g., methylphenidate) and non-stimulant medications (e.g., guanfacine, atomoxetine) as well as different side-effect profiles of non-stimulants. Within the non-stimulant category, a majority of youth receiving non-stimulants (90%) was prescribed an antihypertensive such as the alpha-2 agonist guanfacine (Intuniv). Other non-stimulants, such as atomoxetine, carry similar side-effects as stimulants medications (i.e., appetite suppression, sleep difficulties, growth suppression) whereas apha-2 agonists carry side-effects related to reduced heart rate, hypotension and sedation and can be prescribed to address sleep difficulties associated with stimulants. The side-effects with guanfacine are generally resolved after about 8 weeks (Huss, et al., 2016). However, Intuniv has less research support and the available research indicates lower clinically significant response rates (60%; Ruggiero et al., 2014) than stimulants (75-90%; Vaughan et al., 2012) suggesting a need to further investigate the prescription histories of youth within wraparound to gain a more clear understanding of this finding.

Participants in this study who entered wraparound taking psychotropic medications had similar rates of individual psychotropic prescriptions, with the exception of higher rates of medication for ADHD driven by elevated rates of non-stimulants for ADHD, suggesting that youth in wraparound are similar to other groups of vulnerable youth and face similar trends in psychotropic medication usage. That the majority youth in wraparound are prescribed psychotropic medication emphasizes the concern about increasing reliance on psychotropic medications especially given the potential for serious side-effects with antipsychotics and antidepressants (McMillen et al., 2007) and national trends indicating psychotropic prescription rates are increasing rapidly (Olfson et al., 2014).

While there is a large body of research indicating that the use of individual classes of medication is evidence-based (Correll et al., 2011; Kodish, Rockhill, Ryan, & Varley, 2011; Reyes, Buitelaar, Toren, Augustyns, & Erdekens, 2014) it is clear that most participants receive more than one medication indicated by rates of polypharmacy (i.e., more than one medication regardless of class; 72%) and multi-class treatments (i.e., medication from more than one class; 61%), which are not evidence-based practices and carry elevated risk of side-effects. Polypharmacy rates were comparable to rates reported in the literature (55-73%; Sullivan & Sadeh, 2015; Zito et al., 2008). This rate corresponded to an average of 2.38 medications for those youth who were prescribed psychotropics at time of entry into wraparound. There is limited empirical investigation of polypharmacy especially among children and adolescents (Morden & Goodman, 2012), which is problematic given these high rates and the increases in side-effects associated with taking multiple psychotropic medications.

Of further concern are findings that when prescribed medication, participants received medications from more than one class, multi-class treatments, at greater rates (61%) than previous reports of multi-class treatments among youth who take psychotropic medications (22-52%; Martin et al., 2003; Sullivan & Sadeh, 2015). Multi-class treatments, more than polypharmacy, carry elevated level of side-effects due to potential interactions between psychoactive agents from different classes and have scarce research support (Zonfrillo, Penn, & Leonard, 2005). There are several potential reasons why a child would be prescribed medications from multiple classes (e.g., managing different symptoms, managing side-effects) however such combinations are not well-researched or understood. Multiple psychotropic medications from the same class may be prescribed to augment therapeutic benefits, such as prescribing more than one antipsychotic medication. The high rates of polypharmacy and multi-class treatments are

consistent with the notion that vulnerable youth may be overmedicated (McMillen, Fedoravicius, Rowe, Zima, & Ware, 2007; Zakriski et al., 2005) and reinforces the need to critically examine psychotropic prescription practices within wraparound care.

It is important to reiterate that participants were only cases whose wraparound teams judged that they met their treatment goals indicating that they may have had more positive outcomes than excluded cases (e.g., attrition, incomplete data) who did not necessarily attain treatment goals. In fact, from the data available, excluded cases took a greater number of medications initially (mean=1.73, SD=1.62) than study participants (mean=1.37, SD=1.50; $t[1028]=3.61$, $p<.001$) indicating that the rates of medication may be greater for the entire wraparound population than the study sample. These high rates of psychotropic medication use further support the need to provide comprehensive mental health care and increased monitoring of psychotropic medication practices (Harper et al., 2014).

It is somewhat surprising that even though there was an 11% reduction in number of medications prescribed from entry (mean=2.38) to exit (mean=2.11), this finding was not statistically significant though was similar to a trend for reductions found in a state-report (51% to 41%; Bouska, n.d.). These nonsignificant decreases also were apparent when examining overall rates of monotherapy, polypharmacy, multi-class treatments, antidepressants, antipsychotics, ADHD medications, stimulants, and non-stimulants. Using the uncorrected p-values there were reductions in several of the prescription rates (i.e., monotherapy, polypharmacy, antipsychotics), though these results became non-significant after the Benjamini Hochberg correction. The Benjamini Hochberg correction controls for type I error rates by using a step-wise procedure for the false discovery rate. The non-significant findings appear to be inconsistent with wraparound goals described in the literature to reduce psychotropic medication

usage (Washington Revised Code, 2007). This suggests that more research and clinical attention should be paid to this aspect of wraparound service delivery.

There were no demographic variables that significantly predicted changes in medication rates (i.e., interaction between time and demographic variable) for any of the analyses performed. These findings were consistent with hypotheses predicting that wraparound would function similarly for youth across a variety of demographic groups. However, contrary to expectation, there was not significant results for the age variable. It was anticipated that younger children would show a greater decrease in medication rates after initiating wraparound due in part to findings that psychopharmacological interventions have more favorable outcomes and fewer side-effects for older children (Tsapakis et al., 2008; Vaughan et al., 2012). It was important to establish the relative similarity of medication-related outcomes for youth from a variety of backgrounds in the context of findings that youth in foster care, males, and older youth tend to receive psychotropic medications at higher rates than their peers (Martin et al., 2003; Sullivan & Sadeh, 2015).

There has been increasing interest in examining the psychotropic treatment practices among youth in foster care given that these youth may lack advocates and may be particularly vulnerable to being prescribed high rates of psychotropic medications and antipsychotic medications in particular (Burcu et al., 2014; Martin et al., 2003). The number of youth in foster care receiving antipsychotic medications at the entry into wraparound was 14%, and was 10% at wraparound exit, both of which are lower than rates found for the overall sample in the current study (34%) and rates reported for youth in foster care in other samples (53%, Zito et al., 2008). However, the rates of antipsychotic medications for youth in foster care receiving wraparound are elevated when compared the rates found in the general population of children and adolescents

(3%; Burcu et al., 2014). It is unclear why participants in foster care received antipsychotic medications at lower rates than reported in extent research especially given similar or slightly lower intake rates of psychotropic medications for youth in foster (mean=2.11, SD=.94) compared to youth not in foster care (mean=2.41, SD=1.25), which run contrary to elevated rates for youth in foster care reported previously (Martin et al., 2003). However, the lower levels of antipsychotics may be related to increased awareness and surveillance of psychotropic treatments, especially those with risk of significant side-effects, among youth in foster care proposed by the Michigan Foster Care Review Board (2012).

There was a significant relationship suggesting that males were more likely to receive medications for ADHD (beta=1.42, p'=.01), which is consistent with the increased rates of ADHD diagnoses for males compared to females (APA, 2013). Gender did not predict changes in this rate indicating that this relationship was maintained from the initial to the exit time points in wraparound. It is promising that there were not differential effects of any of the demographic variables for medication changes suggesting that one group did not have increases in medication whereas others maintained statistically baseline levels of psychotropic medication usage.

Given the relative lack of significant findings related to changes in medication rates, it was important to more closely examine youth who did have reductions in psychotropic medication rates during wraparound. Additionally, it was important to determine if there was a subgroup that had decreased prescription rates and improvements in mental health functioning consistent with the American Academy of Child and Adolescent Psychiatry (Walkup & AACAP Workgroup on Quality Issues, 2009) recommendations that youth receive the fewest medications needed to show improvements in functioning in order to reduce the risk of side-effects. The recommendation to reduce the number of medications takes into account the strong empirical

support for psychotropic medications while acknowledging the side-effects of psychotropic medications generally and the increased risk of side-effects when taking multiple medications. McGinty and colleagues (2013) argue that the wraparound model should be able to meet the goal of improving mental health functioning while ensuring that youth receive the fewest medications possible by providing medication evaluation, reducing barriers between service providers and increasing collaboration.

Youth who had reductions in the number of psychotropic medications had similar improvements in mental health functioning as those who did not take medications, those that had increases in medication, and those that took the same number of medications at the initial and exit time points after controlling for initial mental health functioning and demographic characteristics. All medication groups showed clinically significant improvements in mental health functioning as evidenced by a 20 point or greater reduction in CAFAS scores regardless of their pattern of medication prescriptions. This indicates that participating in wraparound, for the subgroup who had decreases in medication rates, was associated with not only improved mental health functioning similar to other participants, but also could be expected to have reduced risk of side-effects. Further, the lack of differences between pattern of medication prescriptions raises questions about the potential benefit of medications as prescribed in the current study, especially considering initial mental health functioning and demographic characteristics were controlled for. In short, there were no meaningful differences in mental health functioning between youth who took fewer medications and youth who had d increases, had not change, or had decreases in medication rates. It is vital to identify methods for reducing the need for psychotropic prescriptions while improving mental health functioning especially given indications that psychotropic prescription rates are increasing for children and adolescents (Delate et al., 2014;

Olfson et al., 2014; Patel et al., 2005). The similarity between youth who had decreases in medications and other medication patterns suggests wraparound may be one treatment approach that could potentially address this important issue, though more information is needed to determine how one group was able to reduce the number of psychotropic prescriptions.

While this study could not determine if wraparound was directly responsible for reduced medication rates or improvements in mental health functioning for particular subgroups of participants, the association between decreased medications and improved mental health functioning is promising and warrants further investigation. The wraparound process can increase communication between youth, their families and mental health providers to ensure ongoing monitoring and assist with medication management (Harper et al., 2014). When the monitoring process results in reduced medication, youth tend to have positive outcomes related to mental health functioning. Though here to, close communication and advocacy for appropriate care provided by wraparound may have assisted in ensuring a reduction in psychotropic medications appropriate for youths' improvement in functioning.

Youth who initiated medication during wraparound and youth who did not receive medication during wraparound had statistically similar improvements in mental health functioning when controlling for baseline mental health functioning and demographic characteristics (ß=-.07, p'=0.33). The similarity between these groups suggests that, on average, the addition of psychotropic medications to wraparound services is not associated with greater improvements in mental health functioning than wraparound services without psychotropic medication when controlling for baseline mental health functioning and demographic characteristics. This finding was inconsistent with the study hypothesis that the combined wraparound and medication group would have greater improvements in mental health

functioning. Previous research has shown that combining psychosocial and psychotropic treatments had superior outcomes to psychosocial treatments alone (March et al., 2014; MTA Cooperative Group, 1999). However, the similarity in improvement in mental health functioning is potentially consistent with APA's (2006) recommendations for using psychosocial treatment as first line of treatment and supplementing with medication as needed

It is important to reiterate that the results from the current study were for youth diagnosed with SED whose team determined the participant had meet the established treatment goals. The lack of significant changes in medication rates and lack of differences in mental health functioning based on medication patterns for youth who met their treatment goals raises the question about outcomes for youth who may not have met their treatment goals. That is, under a "best case scenario" in which treatment goals are considered to be met, there is little change in medication rates and little evidence for the benefit of psychotropic medication above and beyond other treatments provided as a part of wraparound services. For cases that did not meet treatment goals it is possible that their medication outcomes were worse and their mental health functioning was also likely inferior when compared to youth who met treatment goals.

This study identified important trends and prevalence rates for psychotropic medications among the vulnerable youth who utilize wraparound services. Wraparound services have the ability to provide empirically-supported and coordinated mental health treatments to youth who may otherwise receive inadequate and disjointed services (Harper et al., 2014). The elevated number of psychotropic medications and rates of multi-class treatments for SED youth in wraparound highlights the need to provide more attention to this area, especially given the potential for side-effects (Morden & Goodman, 2012) and low rates of youth's commitment to taking medications (Moses, 2011). There were promising trends, which indicated that

wraparound services may be able to help reduce the need for psychotropic medications while ensuring improvements in mental health functioning. However, the relative lack of overall change in psychotropic medication prescription rates highlights the need to bring greater attention to this area both with research and practice.

Limitations

The nature of the current research project was to describe patterns in medication use and changes in mental health functioning in vulnerable (e.g., low income, SED) youth who received wraparound services within one state. The methods utilized in the study were able to appropriately address the exploratory nature and purpose of the current study, though there were several limitations that should be noted. First, the methods used did not allow for the demonstration of causal effects. Second, the study sample represented only cases in which complete data were available and in which treatment goals were met. Therefore, there may have been an overrepresentation of cases with positive outcomes, though analyses showed that participants were largely similar to attrition cases. However, using this sample was important in order to ensure that the participants received wraparound services.

The medication data represents another potential limitation to the study. The data set was deidentified to protect the identify of participants and so it was not possible to verify the accuracy of the medication information. Wraparound facilitators acquired information about medications from members of the wraparound team such as caregivers, physicians, or the youth. Medical record information would certainly be more reliable and valid.

It is unclear whether the results of this study can be generalized to all wraparound programs, though there are many similarities between the study sample and wraparound participants in other studies. First, the wraparound approach in Michigan stems from the same

theoretical orientation, utilizes the same wraparound principles, and serves similar populations but could differ in important ways. For example, the racial/ethnic background, ages, level of impairment of youth and implementation of wraparound could differ between states though the demographic information shows a close relationship between youth in in current study and vulnerable youth across the country. Second, the studies in the literature review had similar outcomes and each came from distinct geographic areas, had different types of samples, but were all focused on using wraparound principles to guide care. The similarity in findings across geographic locations and with differing samples increases the confidence with which the findings from the current study may generalize to other settings. Lastly, the participants in the current study, as with other wraparound research (i.e., Bruns et al., 2009), met criteria for SED suggesting that they had similar levels of mental health difficulties.

The exploratory nature of the current study resulted in a large number of analyses and variables being included. This was necessary as psychotropic medications within wraparound have largely not been addressed in the literature. However, controlling for the false discovery rate with a large number of analyses may have made it more difficult to detect differences that could be highlighted with more targeted research questions.

Implications

Research. The current study was the first empirical examination of medications within wraparound and as such there is a need to build off of this exploratory analysis. This study provided initial information regarding the usage of medications within wraparound and how medications and mental health functioning change during the wraparound process. The findings from the current study lead directly into several areas of future research including: increasing the

specificity of analyses, examining the role of psychiatrists, and utilizing more intensive research methodology.

The current study dealt with pre- and post-data and so was unable to answer questions regarding the potential changes in medication and mental health functioning while wraparound services were being provided. Future research is needed to determine when within the wraparound process change occurs related to receiving medication and other services. This type of information could help inform practice by determining if there are differences in improvements in functioning depending on when youth receive medication or when youth stop taking medication. Additionally, examining the changes across time (i.e., at each quarterly FSR) could help determine if there is a pattern of mental health functioning in which it would be more or less beneficial to initiate or reduce medications within the wraparound process. This type of information would not only be fruitful areas of research, but could also provide guidance to wraparound teams. Similarly, including analyses of attrition cases could help guide wraparound teams to determine ways to maintain youth in wraparound and meet the needs of all youth.

A second area of needed future research could focus on the effects of having psychiatrists as a part of the wraparound team. Miline (2014) and McGinty and colleagues (2013) both highlight the potential benefits of including psychiatrists in the wraparound team both for monitoring medications and also providing expertise in other mental health interventions. Including these important care-providers is consistent with wraparound principles emphasizing collaboration (Bruns et al., 2004). Future research is needed to examine the extent to which psychiatrists are included within the wraparound process and the effects of such an inclusion. Current barriers to involvement of psychiatrists within wraparound are partly system-level barriers such as time and resources (McGinty et al, 2013). Future research has the potential to

build a justification for including psychiatrists in the wraparound team and increasing the collaboration with psychiatrists to improve outcomes for youth.

Utilizing randomized methodology could strengthen the examination of psychotropic medications within wraparound. There are examples within the literature for using experimental design within wraparound (i.e., Bruns et al., 2014), though these studies do not include an examination of psychotropic medication but instead focus largely on changes in mental health functioning. Future research following similar research designs could provide additional information about the effects of using a combined approach within wraparound as well as comparing a combined approach in wraparound to a control not receiving wraparound. Such findings would help to determine if receiving medication within wraparound provided superior outcomes and could potentially bolster the justification for using wraparound services among vulnerable youth. Further, a randomized approach could help determine if the changes in medication observed in the current study compared favorably to a control group.

Practice. The results from this study indicate that a majority of youth in wraparound (56%) were prescribed psychotropic medication thus highlighting a need for additional consideration of medication practices and potential methods to reduce the number of medications prescribed within wraparound services. Additionally, a majority of youth who received psychotropic medication did not receive prescriptions consistent with research supported approaches (Brenner et al., 2014) give that 72% received polypharmacy and 61% received multiclass treatments. These high rates create the need for wraparound teams to take an active role in finding methods to reduce reliance on psychotropic medications and work closely with prescribing physicians to monitor medications. There have been several articles highlighting the importance of psychotropic medications within wraparound (e.g., Harper et al., 2014; McGinty

et al., 2013), though it is not clear that wraparound teams focus on the role of psychotropic treatments. Wraparound teams can help facilitate access to psychiatrists as well as monitoring and ongoing assessment of psychotropic medications, all of which can improve youths' outcomes.

Moses (2011) found that around 62% of youth in wraparound who take medication would discontinue medications if the decision was solely theirs. This low level of commitment creates the potential for youth to subvert the medication process through low-levels of adherence. Therefore, increasing the monitoring of medication practices and medication adherence may help to improve overall care for youth. If there is a low-level of commitment, then it may be appropriate for the team to advocate for reducing medications given findings that youth can have improvements in functioning while reducing the number of medications they take.

By providing advocacy for children and families, the wraparound team can help address ethical concerns regarding medication usage among vulnerable youth. Within this study, a majority of youth who took psychotropic medication receive medication from more than one class (61%) despite a lack of evidence for this practice and increased risk of side-effects. If the wraparound team closely and continuously collaborates with the psychiatrist or primary care physician providing the medications, then youth may be able to receive the fewest medications possible to improve their functioning (Walkup & The AACAP Work Group on Quality Issues, 2009).

APPENDICES

Appendix A. Conceptual model of literature review

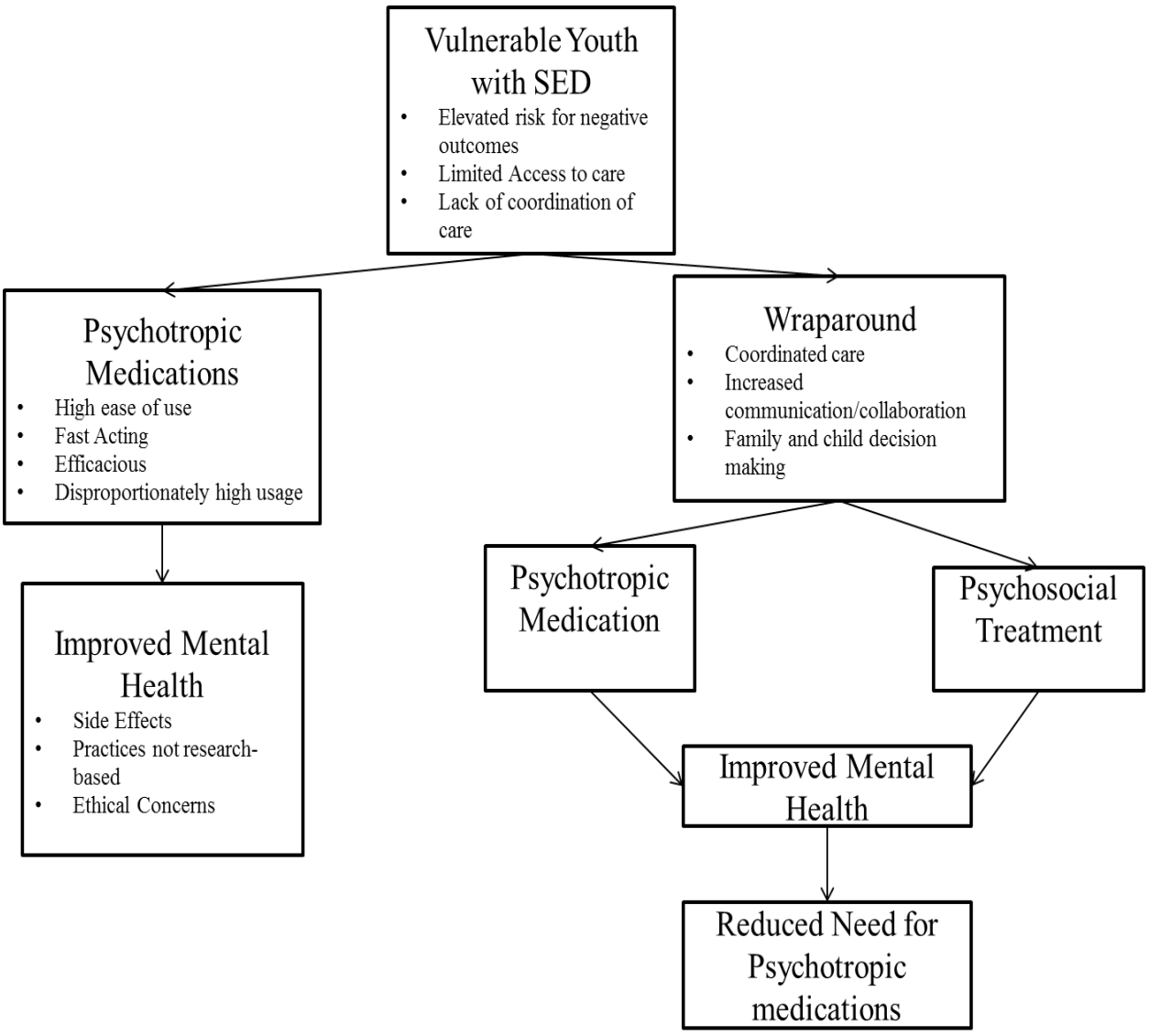

Figure 1. Conceptual model of literature review.

Appendix B. Family Status Report for youth in Michigan

FAMILY STATUS REPORT
(7 – 18 Years of Age)

Agency ID:		**Unique Child ID:**		**DOB:** / /		
Original Date of Intake:			**Date of Current Assessment:**			
Intake Period:	☐ Initial Rating	☐ 3 months	☐ 6 months	☐ 9 months	☐ Annual	☐ Other_____	☐ Graduation
Fund Source:	☐ SEDW-Traditional	☐ SEDW-DHS Pilot	☐ Medicaid	☐ DHS Funding Only		
	☐ Court Funding Only	☐ Blended Funding	☐ Other _____			

RESIDENTIAL LIVING STATUS

FOR ALL QUESTIONS ASKING FOR FREQUENCIES, PLEASE ANSWER FOR THE **LAST 90 DAYS**.

During the past 90 days, how many days has the child resided in each placement? Check current placement (please only check one).

	Number of Days	Check Current Placement		Number of Days	Check Current Placement
Home of birth parent	_____	☐	State hospital	_____	☐
Home of adoptive parent	_____	☐	Inpatient psychiatric unit	_____	☐
Pre-adoptive placement	_____	☐	Crisis resolution/stabilization unit	_____	☐
Permanent foster care	_____	☐	Drug/Alcohol treatment center	_____	☐
Temporary foster care	_____	☐	Emergency shelter	_____	☐
Therapeutic foster care	_____	☐	Paid kinship care	_____	☐
Legal guardian	_____	☐	Independent living	_____	☐
Living w/ relative or family friend (unpaid)	_____	☐	Whereabouts unknown	_____	☐
Detention	_____	☐	Residential treatment	_____	☐
Group home	_____	☐	Other (specify): _____ _____	_____	☐

HOUSING INFORMATION

How many adults and children make up the household?	____ Adults ____Children	
Are the child and parent currently in different living situations?	☐ Yes	☐ No
If the child is in foster care, was the placement changed this quarter?	☐ Yes	☐ No
Has the child returned to his or her home from foster care this past quarter?	☐ Yes	☐ No
Has the family had to seek housing this past quarter?	☐ Yes	☐ No
If YES, How many times?	_____	
Are the caregivers currently employed?	☐ Yes	☐ No
If NO, is the caregiver actively seeking employment?	☐ Yes	☐ No
Is the child content with his or her current living situation?	☐ Yes	☐ No
Has the child expressed any difficultly in adjusting to his or her current living situation?	☐ Yes	☐ No
Has the child expressed concerns with his or her general safety while in the current living situation?	☐ Yes	☐ No
Has the child attempted to run away from home?	☐ Yes	☐ No
If YES, how many times?	_____	
Were there any abuse/neglect investigations regarding the child in this quarter?	☐ Yes	☐ No
If YES, how many times?	_____	

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Figure 2. Family Status Report for youth in Michigan

Figure 2 (cont'd)

	Has a support plan been developed for the child if approaching his or her 18th birthday?	☐ Yes	☐ No	☐ N/A
	If YES, does the child report satisfaction with the transition plan that has been developed?		☐ Yes	☐ No
	If YES, does the caregiver report satisfaction with the transition plan that has been developed?		☐ Yes	☐ No
Comments or Additional Information:				

EDUCATION INFORMATION

PLEASE ANSWER THE FOLLOWING ACCORDING TO THE **LAST 90 DAYS**. (*If on summer break, answer with last known school records.*)			
	Is the child currently in school?	☐ Yes	☐ No
	Is the child home schooled?	☐ Yes	☐ No
	Is the child meeting his or her educational goals?	☐ Yes	☐ No
	If NO, which goals have not been met? _____		
	Is the child passing all of his or her classes?	☐ Yes	☐ No
	If NO, how many classes are they passing? (e.g., 4 out of 6)	____out of ____	
	Is the child currently meeting the standards to pass into the next grade?	☐ Yes	☐ No
	Has the child been truant from school in the past quarter?	☐ Yes	☐ No
	If YES, how many times was the child truant?	_____	
	In the past 90 days, has the child had any out-of-school suspensions?	☐ Yes	☐ No
	If YES, how many times suspended?	_____	
	How many days missed in total due to out-of-school suspensions?	_____	
	In the past 90 days, has the child had any in-school suspensions?	☐ Yes	☐ No
	If YES, how many times suspended?	_____	
Comments or Additional Information:			
	Does the child participate in free or reduced lunch programs?	☐ Yes	☐ No
	Is the child receiving Special Education services?	☐ Yes	☐ No
	If YES, what is his/her identification (List **only if currently** receiving services): _____		
	If YES, are services being provided as written in the IEP?	☐ Yes	☐ No
Comments or Additional Information:			
	Is the child currently receiving 504 planning?	☐ Yes	☐ No

STRENGTHS ASSESSMENT

ANSWER THE FOLLOWING ACCORDING TO THE **LAST 90 DAYS**.					
	Does the child express general interests/hobbies?			☐ Yes	☐ No
	Does the child have the opportunity to engage in these interests/hobbies?			☐ Yes	☐ No
	Is the child actively involved in programs to exhibit these interests and hobbies?			☐ Yes	☐ No
	If YES, where does this happen?	☐ Home	☐ School	☐ Community	☐ Faith-Based
	Does the child express personal goals? (academic, financial, extracurricular or social)			☐ Yes	☐ No
	Is the child taking steps to achieve these goals?			☐ Yes	☐ No
	Does the child have the supports needed to achieve these goals?			☐ Yes	☐ No
	Is the child in generally good health?			☐ Yes	☐ No

2

Figure 2 (cont'd)

	Is the child able to express their needs/desires?	☐ Yes	☐ No
	Is the child able to develop solutions to problems?	☐ Yes	☐ No
	Is the child comfortable engaging with others in social settings?	☐ Yes	☐ No
	Does the child have positive connections in their home?	☐ Yes	☐ No
	Does the child have positive connections in their community?	☐ Yes	☐ No
	Does the child have the coping skills needed to manage stressful situations?	☐ Yes	☐ No
	Does the child have adults from whom they can ask for help when needed?	☐ Yes	☐ No
	Does the child socialize with peers?	☐ Yes	☐ No
	Does the child participate in wraparound team meetings?	☐ Yes	☐ No
	Does the wraparound plan take into account family strengths?	☐ Yes	☐ No

CHILD ADOLESCENT FUNCTIONAL ASSESSMENT SCALE: CAFAS/PECFAS

COMPLETE **ONLY** IF CHILD IS RECEIVING MENTAL HEALTH SERVICES. **(Please ensure that scores are reassessed every 90 days)**		
		Score
	School Role	____
	Home Role	____
	Community Role	____
	Behavior to Others	____
	Moods / Emotions	____
	Mood / Self harm	____
	Substance Abuse	____
	Thinking	____
	Total (Sum of 8 Subscales)	____
	Material Needs Subscale	____
	Family / Social Support Subscale	____

SAFETY INDICATORS

ANSWER THE FOLLOWING ACCORDING TO THE **LAST 90 DAYS**.

	How often has the child…						
	…used drugs?	☐ Has Not Occurred	☐ 1 Time	☐ 2 to 5 Times	☐ 6 to 10 Times	☐ 10+ Times	☐ Child Denies
	…used alcohol?	☐ Has Not Occurred	☐ 1 Time	☐ 2 to 5 Times	☐ 6 to 10 Times	☐ 10+ Times	☐ Child Denies
	…physically hurt themselves on purpose?	☐ Has Not Occurred	☐ 1 Time	☐ 2 to 5 Times	☐ 6 to 10 Times	☐ 10+ Times	☐ Child Denies
	…made verbal statements about hurting themselves or others?	☐ Has Not Occurred	☐ 1 Time	☐ 2 to 5 Times	☐ 6 to 10 Times	☐ 10+ Times	☐ Child Denies
	…physically hurt other people on purpose?	☐ Has Not Occurred	☐ 1 Time	☐ 2 to 5 Times	☐ 6 to 10 Times	☐ 10+ Times	☐ Child Denies

	Was the youth charged with a crime(s) during this quarter?	☐ Yes	☐ No
	Has the child had any probation violations?	☐ Yes	☐ No
	If YES, how many violations?	_____	

3

Figure 2 (cont'd)

Please describe violation:				
MEDICATIONS				
	Does the child currently have a clinical diagnosis?	☐ Yes	☐ No	
	Is the child currently prescribed any medications?	☐ Yes	☐ No	
	If YES, how many medications are prescribed?	_____		
Please list:				
	Does the child take the medication as prescribed?	☐ Yes	☐ No	☐ Taken sporadically

SERVICES PROVIDED

ANSWER THE FOLLOWING FOR SERVICES PROVIDED IN THE **LAST 90 DAYS**.		
Check all that apply:	☐ Intensive Home-Based Therapy	☐ Occupational Therapy
	☐ Outpatient Therapy	☐ Special Therapy (Recreational, Music, Art)
	☐ Day Treatment/Partial Hospital	☐ Speech/Hearing Assessment/Treatment
	☐ Respite	☐ Sensory Integration Assessment/Treatment
	☐ Treatment for Chronic Disease or Health Problems	☐ Substance Abuse Treatment
	☐ Education	☐ Youth-to-Youth Support
	☐ Transportation Services	☐ Volunteer Activities
	☐ Concrete Services (Hard Goods)	☐ Trauma Assessment
	☐ Other Creative Services	☐ Community Athletics
	☐ Psychiatric Services (Evaluation/Medication Monitoring)	☐ Faith-Based Groups
	☐ Group Therapy	☐ After School Activities
	☐ Community Living Support	☐ Tutoring
	☐ Parent-to-Parent Support	☐ Advocacy Support
	☐ Community-Based Activities (please specify): _____	☐ Employment/Vocational Services
	_____	☐ Evidence-Based Treatment (please specify): _____
	☐ Psychological Assessment	_____
	Do services and supports build on existing strengths / interests?	☐ Yes ☐ No

SELECTION OF SERVICES					
	Do caregivers choose the services provided?	☐ Rarely	☐ Less Often	☐ More Often	☐ Frequently
	Does the child participate in the selection of services?	☐ Rarely	☐ Less Often	☐ More Often	☐ Frequently
	Does the caregiver report satisfaction with the frequency of meetings?	☐ Rarely	☐ Less Often	☐ More Often	☐ Frequently
	How often in the past quarter were these services being utilized?	☐ Rarely	☐ Less Often	☐ More Often	☐ Frequently
	Does the child/caregiver report satisfaction with the services received?	☐ Rarely	☐ Less Often	☐ More Often	☐ Frequently
	Does the child/caregiver report satisfaction with the wraparound process?	☐ Rarely	☐ Less Often	☐ More Often	☐ Frequently
Comments or Additional Information:					

TEAM MEMBERSHIP

Figure 2 (cont'd)

NATURAL SUPPORTS		
Check all that apply:	☐ Immediate Family	☐ Community-Based Supports (Please specify)
	☐ Grandparents	☐ Faith-Based Supports
	☐ Extended Family	☐ Kin
	☐ Parent Identified Support	☐ Friends
	☐ Child Identified Support	
SYSTEM-LEVEL SUPPORTS		
Check all that apply:	☐ Department of Human Services	☐ Therapist
	☐ Community Mental Health	☐ Other (Please specify):_____
	☐ School Personnel	☐ Juvenile Court System
OUTCOME MEASUREMENT		
	☐ Outcomes were measured in this past quarter (CHECK ONLY IF TRUE)	
	☐ Progress toward outcomes was identified in this quarter (CHECK ONLY IF TRUE)	

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