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PSYCHOTROPIC MEDICATION USE IN OLDER FOSTER YOUTH:
A FOCUS ON RACIAL DIFFERENCES

by

Sarah Carter Narendorf

A dissertation presented to the
Graduate School of Arts and Sciences
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partial fulfillment of the
requirements for the degree
of Doctor of Philosophy

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Abstract

Problem: The use of psychotropic medications among foster youth has received growing national attention due to high rates of use and concerns about the appropriateness of prescribing.

Understanding medication use in older foster youth is of heightened concern as these youth are preparing to transition out of the state custody and assume the management of their mental health care. While it has been established that rates of medication use are high among this population, little is known about the demographic and clinical factors associated with high rates of medication use and what patterns of use look like over time.

Methods: This study used data from a sample of 404 foster youths in Missouri from 2001-2005 to examine situations associated with medication use at age 17, then characterize patterns of use over the subsequent year for those who remained in state custody (n=294). Data were collected through structured interviews with youths including interviewer derived diagnoses using the Diagnostic Interview Schedule. Analyses focused specifically on examining racial differences between white youths and youths of color. A proposed model of pathways to medication use was tested using multi-group structural equation modeling, patterns of medication use were examined, and youths were classified into medication use subgroups using latent growth mixture modeling.

Results: While rates of medication use were significantly different between white youths and youths of color, the strength of the relationship between mental health problems and psychotropic medication use was not significantly different. White youths were more likely to be taking medications in conjunction with outpatient therapy, while youths of color were more likely to be connected with mental health treatment through the psychiatric hospital or emergency room. No racial differences were identified in the types of psychotropic medications youths were taking, however, youths of color were more likely to discontinue medications over the study year. Four medication use subgroups were identified – a low/no use group (74%), a medium stable medication use group (14%), a declining use group (4%), and a high stable use group (9%).

Youths in the declining and high stable use groups were not significantly different from one another at age 17 and were most likely to be taking antipsychotic medications in addition to antidepressant medications. Youths in the medium use group were primarily taking antidepressant medications and had lower rates of comorbid behavioral disorders than youths in the highest use group.

Conclusion: These results suggest need to further examine racial differences in mental health treatment overall but did not point to racial disparities in medication use. High rates of antidepressant use suggest the potential to reduce medication use through evidence based treatments targeting depression and anxiety. Additional information is needed to better understand the underlying needs that are generating medication use, particularly polypharmacy, in order to develop alternative responses. Youths that took the highest number of medications also presented indicators of complex needs. Targeted interventions to assess and clarify the mental health problems of these youths could improve the quality of their treatment and prevent abrupt discontinuation as they leave state care.

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Chapter 1: Introduction & Overview

Introduction

The use of psychotropic medications as a frontline treatment for child and adolescent mental disorders has increased exponentially over the last two decades (Olfson et al, 2002; Olfson et al, 2006; Thomas et al, 2006; Zito et al, 2003). Among adolescents ages 14-18, the percent of physician office visits where a psychotropic medication was prescribed increased by 191% between 1994 and 2001 from 3.4% to 8.3% (Thomas et al, 2006), evidence of the burgeoning use of these treatments. While these increases are likely driven by the convergence of multiple factors (i.e. increasing diagnoses of psychiatric disorders in children, growing availability of new medications, increasing coverage for the financing of these treatments, and increased marketing of these drugs to consumers; Mayes, Bagwell & Erkulwater, 2009; Warner, 2010), the rapid increases raise concern about the quality and appropriateness of the prescribing. The change in prescribing practices for psychotropic medications has been largely practice, rather than research driven (Vitiello, 2007), heightening the uncertainty around the appropriateness of medication prescribing. FDA mandated black box warnings about the increased risk for suicide with some anti-depressants (Friedman & Leon, 2007) and research on the metabolic side effects associated with atypical antipsychotic medications in adolescents (Correll et al, 2009) underscore the fact that increasing use of these medications comes with associated risks of side effects.

Concerns about the quality of psychiatric prescribing are particularly relevant for youth served in the child welfare system who have rates of medication use 2-3 times higher than the general population (Raghavan et al, 2005). For youth placed in foster care these rates are even higher (dosReis et al, 2001; Ferguson, Glesener & Raschick, 2006; Raghavan & McMillen, 2008; Rubin et al, 2012). These youth are particularly vulnerable due to their experiences of child abuse and neglect and suffer from high rates of mental disorders (Burns et al., 2004). While high rates

of medication use might be expected due to these elevated needs, the need to scrutinize the appropriateness of this use is heightened due to the lack of parents who might normally act in this capacity. Studies of medication use patterns have found that the medication regimens of foster youth are often complicated, with multiple medications prescribed simultaneously (dos Reis et al, 2011; Raghavan & McMillen, 2008; Zito et al, 2008). In a study of medicated foster youth in Texas, Zito et al (2008) found that over 40% of youth received three or more medication classes concomitantly. Another study comparing foster youth with youth on disability Medicaid found that foster youth were more likely to be receiving multiple antipsychotics (dos Reis et al, 2011). These patterns of use, combined with reports from child welfare and mental health providers (McMillen et al, 2005) and the foster youth, themselves (Lee et al, 2006), have fueled concerns about the quality of psychotropic medication prescribing for these young people. Some researchers have characterized the problem as a “crisis”, citing recent high profile media reports and class action law suits related to the use of medications in child welfare (Leslie et al, 2011).

State and federal policy makers have responded to these widely reported concerns with a variety of initiatives to monitor psychotropic prescribing (Leslie et al, 2010a; Naylor et al, 2007) and federal legislation now mandates that each state have a plan for monitoring psychotropic medication prescribing for those in their care (Child and Family Services Improvement and Innovation Act of 2011, House Resolution 2883). Some states use administrative data on medications to identify red flags that trigger additional review such as prescribing at dosages that exceed recommendations or involve multiple medications concomitantly (Leslie et al, 2010a). Other states have implemented systems that provide extra authorization procedures prior to a youth being placed on medications (Leslie et al, 2010a). These practices, however, target the physician as the source of the quality problem without addressing the broader context that may be fueling this prescribing. Psychiatrists often have little time to make a thorough evaluation, are under pressure to medicate symptoms before they result in placement disruptions (McMillen et al, 2007) and may have few other treatments available to offer (personal communication, Ginger

Nicol, 5/12/12). In addition, the clinical presentation of foster youth may be extremely complicated with symptoms that cross diagnostic categories (Courtois, 2008; Narendorf, Bertram & McMillen, 2012). As states develop oversight interventions to reduce potentially inappropriate prescribing, some of the underlying problems that led to these prescriptions remain. The current policy environment provides an opportunity to think about how to target some of the underlying issues that are generating problematic prescribing in combination with these oversight initiatives. Research is needed to inform these policies by documenting not just the fact that youth receive high rates of psychiatric medications but also to understand associated characteristics and situations that lead to this treatment and the nature of the treatment once it is received.

One critical factor that bears specific consideration in examining psychotropic medication use patterns is the role of race. Youth of color are known to suffer disproportionately from unmet mental health needs (Angold et al, 2002; USDHHS, 2001) and are overrepresented in the child welfare system (Belanger, Green & Bullard, 2008). Racial differences in the rates of psychotropic medication use have contributed to additional concerns about the quality of mental health treatment for youth in child welfare. Racial differences in the use of psychotropic medications are not unique to the child welfare context, however. Studies in the general population (Han & Liu, 2005), in Medicaid samples (Zito, 2003), in child welfare (Ferguson et al, 2006; McMillen & Raghavan, 2009; Raghavan et al, 2005; Raghavan & McMillen, 2008), and in juvenile justice and special education (Ryan et al, 2008; Office of Special Education Programs, 2003) have consistently found that white youth are prescribed medications more often and are more likely to take multiple medications compared to youth of other ethnic and racial groups. The consistency and direction of these findings suggests the need for further exploration of the causes of racial differences in medication use.

Foster youths are an interesting population in which to further examine these differences. Youth served in the foster care system all have publicly funded health insurance and have case

managers who are coordinating their care. The fact that disparities persist even when these factors are uniform raises questions about the potential drivers of the racial differences in medication use. Studies on racial disparities in health care utilization identify both individual preferences, preferences of caretakers, and biases/knowledge of health care providers as potential sources of the differences (Institute of Medicine, 2003). Older youth in foster care have case managers and often foster parents who may identify their problems and refer them to treatment so one potential source of disparities may lie with a lack of recognition and referral to treatment by these gatekeepers, even when youth have mental health need. Another point at which the paths of white youth and youth of color may diverge is in mental health settings that usually facilitate access to medication treatment such as outpatient therapy, residential treatment and psychiatric hospitalization. It may be that even once youth of color are connected with mental health treatment in these settings, they are less likely to receive medication treatment than white youth. Further exploration of these pathways can provide some indication of the best points of intervention to ensure that all youth with mental health needs receive appropriate treatment.

Concerns about the quality of psychiatric treatment in child welfare have also been raised about the continuity of this care, especially for foster youth (American Academy of Child and Adolescent Psychiatry, 2005) who are at increased risk for discontinuities in treatment due to the potential for placement instability (Barth et al, 2007; Garrison, 2006). Youth who have difficulties maintaining stable placements often have challenging behaviors that can lead to increases or changes in medications after a placement situation disrupts. Youth exhibiting problematic behaviors are also more likely to come to the attention of providers who feel pressured to do something to address the problem (McMillen et al, 2006). A recent study found extensive medication histories among a small sample of high needs older foster youths, with many providers prescribing many different types of psychotropic medications over time (Narendorf, Bertram, & McMillen, 2012). The eight youths in the study had an average of 13 different psychotropic medications prescribed during their time in foster care. Few studies, however, have

actually examined medication use among foster youth over time in order to characterize medication use as it unfolds month to month rather than at a single point in time. Some youth may have experiences of stability where one medication reliably works over time. Other youth may have experienced many different medications over time with frequent changes. Youth who experience multiple medication changes may represent a group with particularly high needs and warrant specific focus. Approaches that examine subgroups of youth with different medication change patterns can assist in providing a more sophisticated understanding of psychotropic medication use in foster care to guide additional attempts to improve the quality of this care.

Identification of medication use patterns is particularly important for older foster youth who are gaining increasing autonomy. When these youth leave state custody and take over the management of their own mental health care, they have been found to rapidly discontinue treatment (McMillen & Raghavan, 2009). In a study of older youth transitioning out of foster care in Missouri, medication use dropped 60% from the month before youth left care to the month after with the majority of youth reporting they discontinued use at their own initiation (McMillen & Raghavan, 2009). Unfortunately, uncertainty about the appropriateness of medication prescribing for these youth makes it difficult to know how many of them are going without treatments that have contributed to stability, or are actually freeing themselves from the burden of unnecessary medications. Given the high rates of mental health need among these youth, however, it is safe to assume that many would benefit from ongoing mental health supports. While the life outcomes for all youth who age out of foster care are notably grim compared to their peers in the general population (Courtney, Dworsky, Lee & Raap, 2010a), youth who have the additional burden of mental health problems are particularly vulnerable to negative outcomes including homelessness, incarceration and unemployment (Courtney, Hook, & Lee, 2010b). An examination of medication use pathways and patterns can assist in deepening our understanding of the underlying characteristics and medication experiences of these youth in order to provide better supports in the critical period prior to transition from state custody.

The Current Study

This dissertation study was designed to fill a gap in our knowledge of psychotropic medication use for older youth in foster care by examining pathways and patterns of medication use with structural equation modeling and latent growth mixture modeling. It explicitly examined the critical contribution of race by testing racial differences in paths associated with medication use, then examined how these differences played out over time in medication use patterns. In order to answer these questions, this study utilized data from Voyages, a longitudinal study of older youths transitioning out of foster care in Missouri conducted from 2001-2005. The Voyages Study focused specifically on the mental health needs and experiences of older youths who were interviewed every three months between ages 17 and 19 using a structured interview that included the Diagnostic Interview Schedule and structured measures of service use (detailed in Chapter 3, p.42). The current study included data newly entered from the original written history calendars that enabled examination of medication use by month. It was guided by the insights of the Gateway Provider Model (Stiffman, Pescosolido & Cabassa, 2004) on the importance of providers in connecting youth to appropriate treatments and by the Network Episode Model (Pescosolido & Boyer, 1999) in its conceptualization of service use as a longitudinal phenomenon that unfolds over time. Rather than stop at an examination of medication use at a single point in time, the study described medication use “episodes” based on service use over a year.

Specific Aims

This dissertation study pursued the following aims:

Aim 1: To examine the relationship of underlying risk factors (maltreatment & family mental health history), indicated need (mental health problems), and facilitating situations (mental health treatment) to the use of psychotropic medication in a cohort of 17 year old foster youths, focused specifically on understanding how these relationships perform differently for white youths and youths of color. A structural equation model was constructed and tested simultaneously for each racial group.

Aim 2: To characterize longitudinal medication use episodes by examining patterns and circumstances of continuity and change in psychotropic medication use from age 17-18 and investigate how these patterns vary by race. Characterizing medication changes over time required examination of a number of indicators. This study documented: the average number of medications used each month, the number of medications added, the number of medications discontinued, the total number of changes over the time period, and the percentage who remained on the same medication regimen throughout the study. Bivariate analyses examined each of these changes by race.

Aim 3: To identify and characterize subgroups of youths with similar medication utilization patterns specifically accounting for race and explore the association of group membership with later outcomes.

3A. A latent growth model was used to identify classes of youths with different medication use patterns, including living situation as a covariate.

3B. To further understand subgroup composition, post hoc analyses examined characteristics associated with subgroup membership including race, gender, family mental health history, diagnoses, symptoms, functional indicators, maltreatment history, and placement changes.

3C. Analyses examined whether these subgroups were associated with mental health and functional outcomes and with attitudes toward mental health services at age 19.

In order to address these aims, this dissertation first examined medication use at age 17 using the entire Voyages sample (n=404) to test a structural equation model of the paths associated with medication use. Models were tested simultaneously for white youths and youths of color. Next, the study used a sample of all youths who remained in care until they were 18 years old (n=294) to characterize medication use patterns over the subsequent year and examined whether experiences differed by race. A latent growth mixture modeling approach was used to identify subgroups of youths with different medication use patterns prior to their exit from the child welfare system, examining race as a key covariate. Finally, the study characterized these groups by examining the association of these subgroups with characteristics at the start of the study at age 17 and with mental health and functional outcomes at age 19. This study provides new information to inform our understanding of racial differences in medication treatment and provides a more nuanced understanding of the different psychiatric medication

treatment experiences of older foster youths. A better understanding of racial differences in pathways to medication use can assist in identifying targets for future intervention to reduce these differences. In addition, a better understanding of subgroups of medication use patterns can assist in developing interventions to provide tailored education and transition planning that responds to the different profiles of different groups.

Chapter 2: Previous Research

Introduction

This dissertation study was guided by prior research on older youth in foster care, their use of psychotropic medications, and by broader conceptual work on help-seeking, race, and the use of health services. This chapter provides an overview of these empirical and theoretical underpinnings. In order to orient readers to the challenges particular to thinking about psychiatric medication use, the chapter begins with a brief discussion of the controversy related to use of medications. It then moves to a description of conceptual models that have been used to understand the use of health services overall and how these models may be applied and modified specifically with race and medication use in mind. It then reviews the relevant empirical research starting with the rates of medication use for youths in child welfare. Empirical work on factors that are expected to relate to medication use is reviewed with a specific focus on how these apply to older foster youth. Foster youth have unique situations and needs which influenced the conceptualization of this study. The chapter concludes by revisiting the conceptual work to present the model for the dissertation study aims with hypotheses.

Challenges in Characterizing Psychotropic Medication Use

The National Institute of Mental Health website describes psychiatric medications (also called psychotropic medications) as medications used to treat the symptoms of mental disorders that help people feel better so they can function (<http://www.nimh.nih.gov/health/publications/mental-health-medications/complete-index.shtml>, accessed 5/12/12). While this portrayal highlights the benefits of medications, the role these drugs play in mental health treatment has become an increasing focus of both scrutiny and concern. Dramatic increases in the prescribing of psychiatric medications to children and adolescents (Cooper et al., 2006; Olfson et al, 2002; Thomas et al, 2006; Zito et al., 2003), particularly increases in the use of powerful antipsychotic medications (Cooper et al, 2006, Olfson

et al, 2006; Patel et al, 2005) have raised concern about the level of evidence supporting their use (Rosenheck, 2005; Vitiello, 2007). These concerns have gained increasing traction as evidence for adverse side effects associated with these medications mounts (Correll et al, 2009). Rapid increases in the use of psychotropic medications for children and adolescents in particular have generated discussion and controversy about the use of medications in our society and the medicalization of behavioral problems.

Through the 1990s, increases in the number of children who were diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) and treated with stimulants such as Ritalin gained attention in the popular press. Concerns were raised that these medications were being overused to medicate normal behavior and parents complained that they were pressured by schools to place their children on medications to control their behavior. Some critics questioned the existence of ADHD itself, attributing problems to permissive parenting (Mayes, Bagwell, & Erkulwater, 2009). In addition, little research has supported long term benefits to these medications, raising questions about their extensive use (Sroufe, 2011). Similar issues have been raised more broadly about the use of psychotropic medications for a variety of mental disorders. Increases in the use of anti-depressants have led to charges that medications are being used to shield adolescents from some of the normal ups and downs of life. The use of powerful medications such as anti-psychotics, especially in young children, have led to concerns that medications are being inappropriately used to manage tantrums and annoying behaviors (Warner, 2010). A recent book by Whitaker documents an epidemic of mental illness that has potentially been created and fueled by the existence of psychotropic drugs to treat them (Whitaker, 2010). He points to increasing rates of disability related to mental disorders in spite of the large increases in medications that should improve functioning (Whitaker, 2010).

In addition to these underlying concerns about the decision to use medications as a treatment for behavioral problems, the influence of the pharmaceutical industry in marketing

these drugs and funding research on their efficacy has further undermined confidence in the legitimacy of medication treatment. Psychotropic medications are big business for these pharmaceutical companies. Antipsychotics have become a top-selling class of medications in the U.S. (<http://www.imshealth.com/portal/site/imshealth>, accessed 4/27/10) and five of the top twenty best selling drugs in America in 2009 were psychiatric medications (http://www.forbes.com/2006/02/27/pfizer-merck-genentech-cx_mh_0224topsellingdrugs.html, accessed 3/17/10). The FDA Modernization Act of 1997 enabled pharmaceutical companies to market directly to consumers and loosened regulations on off-label prescribing (<http://library.findlaw.com/1997/Nov/21/129012.html>, accessed 3/16/10) giving pharmaceutical companies increased access to consumers and increased power to sell the merits of newer drugs beyond their on-label uses. The aggressive marketing of these drugs which oversold benefits and downplayed side effects has led to civil and criminal convictions and billions in fines leveraged against Johnson & Johnson for its marketing of Risperdal and Eli Lilly for its marketing of Zyprexa (Thomas, April 11, 2012, <http://www.nytimes.com/2012/04/12/business/drug-giant-is-fined-1-2-billion-in-arkansas.html#>). Research on these psychiatric medications has also been increasingly funded by pharmaceutical companies, contributing to an overstating of positive results (Rosenheck, 2005). Close financial ties between researchers and pharmaceutical companies have raised doubts about the quality of research supporting the efficacy of the drugs and the motivations of researchers who have promoted their use (Warner, 2010).

These issues have fueled questions about the appropriateness of medications as a treatment for child and adolescent mental disorders. While the use of these medications increases, there remains much uncertainty about whether these increases reflect the connection of young people with treatments they need or reactive prescribing by psychiatrists who may be influenced by pharmaceutical companies and pressured by parents and other involved adults who demand medications as an immediate solution for many problems. A recent book by journalist,

Judith Warner (2010), investigated these controversies about the use of medication for child and adolescent mental health problems. She found that the decision of parents to seek medications for their children was not taken lightly but was often a last resort in the face of the overwhelming challenges of dealing with the problems their children presented. Rather than overuse of psychiatric treatment, Warner found that treatment, and especially quality mental health treatment, was extremely difficult to access. While the unethical behavior of some pharmaceutical companies and researchers in marketing and researching these drugs has legitimately raised questions about their use, for the families Warner talked to, the medications were often critical to ensuring that a youth could function in a community setting (Warner, 2010).

The use of psychiatric medications for youth in the child welfare system has gained a great deal of attention due to the elevated rates of use in this population (Raghavan et al, 2005; Rubin et al, 2012; US GAO, 2011) and the extensive use of polypharmacy (dos Reis et al, 2011; Zito, 2008;). In addition, the unique vulnerability of foster youth heightens the urgency of policy intervention since these children often lack the advocacy of the parents that Warner found fought zealously for appropriate treatment for their children. Recent reporting about the overuse of medications for kids in foster care in the national news (20/20 program aired 12/2/11, <http://abcnews.go.com/Health/mind-altering-psych-drugs-year/story?id=15066848>) and a recent federal report from the General Accounting Office have brought national attention to this issue (US GAO, 2011). A qualitative study of psychiatric treatment in one foster care system found wide concerns among professionals about the quality of prescribing including overuse of medications, overmedicated children, and discontinuities in treatments as youth changed caseworkers or placements (McMillen et al, 2007). Some states have begun to respond to concerns about the quality of psychotropic prescribing with policies to increase the oversight of prescribing practices (Leslie et al, 2010a) and recent federal legislation specifically directs all states to develop oversight policies (the Child and Family Services Improvement and Innovation Act of 2011, House Resolution 2883). As policies promote increased oversight, however, it is

important to think more broadly about this prescribing and the problems and context that may contribute. Youth in foster care are a high need population and many of these youth may benefit from mental health treatment that incorporates psychiatric medication.

Given the type of data collected in the Voyages study which utilized youth report, this dissertation was unable to directly speak to the appropriateness of the prescribing to the older youth in the study sample. It does, however, provide analyses to better understand the relationship between needs, services, and medication treatment. In addition, the examination of medication use patterns provides new information about medication use over time and subgroups of youths with different patterns of use. While the quality concerns around the use of psychotropic medications make it difficult to know whether use of psychotropic medications is essentially a good thing, a more thorough investigation of the phenomenon through this dissertation provides additional information to guide future efforts to improve the quality of treatment for older foster youth.

Conceptual Framework

The next section reviews the theoretical work that informed the investigation of psychotropic medication use among older foster youth in this study. It begins with a brief review of well-known theories of health service use that provided a starting point for identifying constructs to explain medication use, then finishes with a discussion on theoretical ideas on the role of race in health service use.

Theories of Health Service Use

Andersen's Behavioral Model

One of the most well-known models of health service use is Andersen's socio-behavioral model of access to health services (Andersen, 2008). It is less an explanatory model than a framework for grouping variables into constructs that are critical components of gaining access to

health services. Individually focused theories of health service use such as the Health Belief Model (Stretcher, Champion & Rosenheck, 1997) and the Theory of Planned Behavior (Ajzen, 1991) seek to explain why an individual might make a decision to seek mental health services. The Andersen model includes these ideas but identifies additional contextual factors that influence whether a person successfully accesses services once the decision to seek help has been made. The core components of the Andersen model are predisposing factors, enabling resources, and need (Andersen, 2008). These constructs provide a base for thinking about critical individual level variables to include in models related to service use. Predisposing characteristics are both internal and external characteristics that may predispose an individual to seek mental health services. This construct includes demographic characteristics, attitudes, and health beliefs. Enabling resources are conceptualized as things that promote access to care such as transportation and insurance which move the individual along in the process of seeking health services. Need is then the final component in the process of help seeking and includes both the individual's perception of their need for treatment and the objective need as evaluated by some external source. In Andersen's original model, these three core constructs were expected to operate differently for different types of health services so that hospital services in response to serious physical conditions would be mostly explained by need as compared to more discretionary services like dental care in which enabling resources would play a larger role. The model is currently most often used to guide the selection of constructs rather than to explain relationships between them.

For youth in the foster care system, use of medication treatment would ideally be driven by need. These youth have uniform access to insurance and are in a system that is charged with getting them to appropriate treatment. The quality concerns and racial differences in service use underscore the fact that factors beyond need may be driving this treatment. This study was guided by the Andersen model in selection of constructs to explain the differences in treatment access and treatment patterns. For older youth in the foster care system, attitudes about mental

health treatment may influence their use of medications. At the same time, the perceptions and knowledge of their case manager and foster parents also play a key role since these individuals are responsible for directing youth to care. Additional models of service use expand on the Andersen model to further detail the importance of these relationships, especially as they unfold over time.

Network Episode Model

The Andersen model presents service use as a point in time phenomenon that occurs as the end result of a process. This depiction fails to capture the true complexity of mental health service use *episodes* which generally occur over multiple points in time. Bernice Pescosolido has presented an alternative conceptualization of how individuals utilize health services in her network episode model (NEM, Pescosolido & Boyer, 1999). The model starts with the concept of the “episode base” which contains information about the person and factors specific to the episode of service that begins the help-seeking process such as current symptoms and accessibility of treatment. Rather than a straightforward process of seeking care, the model views each service use episode as the product of interactions between the individual, the treatment system and the social system, producing an illness career. In this model, experiences of treatment are a core component of the illness career.

The NEM provides additional insight beyond the Andersen model into two important concepts: 1) service use does not occur at one point in time but is part of an illness career that occurs over time and 2) service use is influenced by the social context so that individuals are rarely making strictly rational decisions to seek services. This is especially true for youth as recognized in the Children’s Network Episode model (Costello et al, 1998) which acknowledges the key role of gatekeepers in getting and keeping young people connected to mental health care. In the NEM, service use at a single point in time is actually part of a larger construct, the illness career. The illness career includes entrances and exits into services, the timing and sequencing

of services, and the degree and length of compliance. This model guides this dissertation study in examining medication use in detail over 12 months to better characterize the nature of psychotropic service episodes for older youth in foster care.

The Gateway Provider Model

The Gateway Provider Model (Stiffman et al, 2004) is an elaboration on the NEM which also includes elements of Decision theory to assist in understanding how providers make decisions to refer youth to mental health treatment. It utilizes the core constructs that Andersen initially identified, however, it places the gateway provider at the center of the model as a mediator between predisposing, enabling, and need characteristics and whether youth actually receive mental health services. Gateway providers as conceived in this model could be parents, teachers, case workers, or other key providers that can connect a youth to appropriate mental health services. The provider's evaluation of the mental health needs of the youth play a key role in whether the youth will actually be connected with services. The gateway provider model emphasizes the importance of the context in which these gateway providers are operating including structural characterizations of their organization as influencing their perceptions and knowledge.

The gateway provider model guided this dissertation study in its focus on the importance of service providers in directing youth to care. In this study, mental health service settings were examined as mediators between mental health need and psychiatric medication use because these are settings in which trained mental health providers are assessing and connecting youth with treatment. This study viewed these settings as mediators because youth encounter additional gateway mental health providers.

Racial Disparities and Health Treatment

This study specifically examined differences in medication use by race. Disentangling the source of these differences can be difficult since race pervades a youth's entire experience

and may shape both their attitudes and preferences about medications and their interactions with providers. The term race is used, here, since the current study was based on youth's self-identification of their race. This construct is really a narrow proxy for the ethnic group or heritage the youth identifies with and the broader cultural values and norms that may be associated with that. Models that have sought to explain the contribution of race to help-seeking for mental health problems have noted the importance of culture and community context in shaping adolescents' recognition of their problems, their decisions to seek help, and their selection of a type of service once the decision to seek help has been made (Cauce, 2002). Race cannot be distilled down to one simple construct but is likely to influence each step in the help seeking process (Eiraldi et al, 2006).

The influence of race goes beyond the decision to seek help, however. Even when racial and ethnic minorities access treatment, disparities in the quality and types of health treatment have been noted across a range of health problems (Institute of Medicine, 2003). Conceptual work that has sought to explain racial differences in treatment in the face of uniform access have identified sources of bias at multiple levels (IOM, 2003). The first is individual patient preferences for treatment. The individual's attitude toward their illness, their values, and their beliefs about appropriate treatments will shape the type of treatments they receive. The negative perceptions among many youth about medication treatment (Buston, 2002; Draucker et al, 2003; Lee et al, 2006) may be more pervasive among youth of color and hence these youth may be less likely to receive treatment simply because they don't want it. In addition, concerns about stigma, mistrust of medical providers among minority groups and previous experiences of discrimination may also lead youth of color to view the experience of medication treatment as less desirable (Ayalon & Alvidrez, 2007; IOM, 2003).

Another key source of health care disparities enters at the provider level. Provider interpretations of the symptoms the patient presents may be influenced by their level of cultural

competency in identifying how race may impact the presentation of symptoms. This may result in systematically different treatments for different racial groups (IOM, 2003). This bias occurs at the level of individual clinicians but can also become shared in the practice beliefs of organizations (Snowden, 2003). As the Gateway Provider Model highlights, for youth served in public systems, bias in the identification of symptoms can occur at multiple points in which the youth encounters providers who can potentially link them to treatment. These treatment encounters also occur within the broader community and societal context which shapes the attitudes of patients and providers alike.

An additional factor that may contribute to differential treatment patterns for white youth and youth of color is the differential presentation and interpretation of symptoms between youth of different racial and ethnic groups. How an individual interprets the symptoms they experience and then the way that they report these symptoms to providers has been found to differ across different cultural groups (Kleinman, 1988). Sociocultural theory posits that the manifestation of mental health symptoms is influenced by the cultural context in which certain feelings and complaints are viewed as acceptable (Kleinman, 1988). Both the symptom presentation of the individual and the providers' interpretation of the symptoms are influenced by their cultural background. Youth of color, therefore, may present their symptoms differently and receive different treatments as a result. Providers' conceptualizations of how symptoms are presented may also influence their determination about what types of symptoms require which types of treatments. This study examined how treatment paths and patterns of white youth and youth of color differed with a specific focus on mental health needs and how these needs were related to the receipt of medication treatment. The choice of a multigroup structural equation modeling strategy in this study comes out of the idea that race moderates the entire help seeking process. The use of an analytic technique that can examine the role of race on all the proposed pathways is ideally suited to examine racial differences in medication use.

The next sections will move to a discussion of the empirical literature that supported the choice of study constructs related to psychotropic medication use in this population. The section begins with a review of evidence on prevalence of medication use in child welfare, then moves to a review of factors that may influence medication use in older foster youth.

Psychotropic Medication Use in Child Welfare

The following section reviews the evidence for what is known about rates of medication use for youth in the child welfare system and particularly foster care. When evidence is available specific to older youth, these rates will be reported in lieu of broader findings.

Prevalence

Studies have established that youth in foster care have both high rates of medication use and high rates of polypharmacy (Ferguson et al, 2006; Raghavan & McMillen, 2008; Zito et al, 2008). Studies that have reported specifically on psychotropic medication rates in older foster youth have found that between 22-58% of youth in the samples were taking a psychotropic medication (Courtney et al, 2005; Ferguson et al, 2006; U.S. GAO, 2011; McMillen et al, 2004). For example, in their study of medicated foster youth in Texas, Zito et al (2008) found that youth age 15-19 took an average of 2.28 medications per youth. This study used Medicaid claims over one month to examine the number and types of medications youth were taking. Older youth in the study were taking slightly fewer medications on average than the overall sample that averaged 2.55 medications (Zito et al, 2008). Two studies of older foster youth specifically used youth self-report to assess medication use. At age 17, 35% of youth in the Voyages study were taking a medication with 10% taking 3 or more medications concomitantly (Raghavan & McMillen, 2008). In the Midwest study of older foster youth, 22% of youth had taken a medication in the past year at the first wave of the study (Courtney et al, 2005).

These overall rates of medication use, however, mask the variation in the types of medications youths may take. Several studies have reported on medication classes and

particular types of medications. This level of specificity can provide additional clues about the experiences of taking these medications as the acceptability and tolerability of different medications may be different as evidenced by different side effect profiles. Recent concerns have focused around the increases in anti-psychotic prescribing (Cooper et al, 2006; Patel et al, 2005) and the serious side effects associated with their use such as rapid weight gain and metabolic changes (Correll et al, 2009). Studies conducted in the last decade have generally found widespread use of anti-depressants and anti-psychotics, especially among youth that were taking more than one medication (Raghavan & McMillen, 2008; Zito et al, 2008). Among all youth in Zito's Texas sample (2008), anti-depressants, stimulants, and antipsychotics were most widely prescribed. In the Voyages study, the most common medications were anti-depressants, antipsychotics and mood stabilizers. Most youth (80%) who were taking three or more medications were taking an anti-psychotic as part of their medication regimen (Raghavan & McMillen, 2008). The current dissertation study built on prior work to examine the use of these specific types of medications over time, considering the stability of medication regimens by medication type.

Psychotropic Medication Use Over Time

While previous research has highlighted the high rates of psychotropic medication use among older youth in foster care, longitudinal research on medication use is more limited. A recent study (Leslie et al, 2010b) examined data from the National Survey of Child and Adolescent Wellbeing (NSCAW) study across three years to categorize patterns of use over time. It utilized a measure of whether youth were currently on medications asked annually over the three years. Using a latent growth mixture modeling approach, the authors were able to identify three distinct subgroups of medication use patterns among this group - low medication use where medication was used rarely or never, increasing medication use where medication was started after child welfare investigation and high medication use where medication was endorsed over multiple study waves. The authors concluded that medication use trajectories for youth in child

welfare are best understood when disaggregated into distinct subpopulations (Leslie et al, 2010b).

While the Leslie et al (2010b) study provides a starting point for thinking about different groups of youth in child welfare based on their psychotropic medication use, it is limited in its ability to provide information about the complexity and continuity of the medication regimens over time. It still used repeated cross sectional measures rather than conveying continuous information about what an episode of medication treatment looks like. Little research to date has reported on the stability of medication regimens over time in this population. A study by dosReis et al (2011) provides some information by examining antipsychotic use for foster children using Medicaid data. They found that youth were on antipsychotic medications for an average length of 222 days with a standard deviation of 110 days (dosReis et al, 2011). This evidence supports the idea that medication regimens for many youths are likely to change over a one year period. This dissertation study took a fine grained approach to understanding medication changes for youth who stayed in foster care in the year between age 17 and 18, a critical point for these older youth as many of them left care between ages 18 and 19. Patterns for these youth were expected to differ from those presented by Leslie et al (2010b) which were based on younger children, many of whom were initiating contact with the broader child welfare system.

Factors that May Influence Medication Use in Older Foster Youth

The current study focused on the use of psychotropic medications among a sample of older foster youth. In order to understand the medication use patterns of older youths in the foster care system, it is important to recognize the particular characteristics of this population and how they may contribute to medication use. These youth have high rates of maltreatment, placement instability, and mental health problems, all factors that may play a key role in their medication use patterns. In addition, African American youth are over-represented in this population, a fact which leads to differences in the characteristics of white and black youth exiting

foster care. The following section reviews empirical research on factors that may influence psychotropic medication use patterns in older foster youth.

Maltreatment

One factor that sets foster youth apart from youth in the general population is their high rates of maltreatment. Maltreatment is a predisposing risk factor that influences the need for mental health treatment. Youth in foster care are particularly vulnerable to mental health problems due to these histories of family disruption and maltreatment, experiences that have been associated with increased risk for psychiatric disorders into adulthood (Green et al, 2010; McLaughlin et al, 2010). In addition, many of these youth have experienced more than one type of maltreatment, placing them at even greater risk for psychosocial problems. A review of research on types of maltreatment found that experiencing multiple types of maltreatment was associated with greater adjustment problems than experiencing any one type alone (Higgins & McCabe, 2001). In a report of findings from the Voyages study, McMillen et al (2005) found that the number of types of maltreatment older youth experienced was more predictive of past year psychiatric disorders than any single type of abuse. These findings stress the importance of considering the cumulative effects of multiple forms of abuse in understanding both mental health need and the services provided to address these needs, including psychotropic medication. In the current study, number of different types of maltreatment was expected to contribute to higher mental health need.

Family Mental Health History

Having a family history of mental illness has been found to increase risk for a variety of mental disorders (American Psychiatric Association, 2000). Parent mental illness has also been associated with increased risk for child maltreatment (Walsh, MacMillan & Jamieson, 2002). In addition, parents who are so disabled that they are unable to take care of their children may be more likely to place them in foster care. Therefore, family history of mental health problems was

also expected to contribute to higher mental health need and was included as a predisposing factor in this study.

Mental Health Need

Mental health need as a construct has been conceptualized and measured in several different ways. Approaches to the measurement of mental health need have included using diagnoses as an indicator of need for services, assessing functional impairment, and examining exposure to risk (Costello et al, 1993). Youth involved in the foster care system have high levels of mental health diagnoses and symptoms as assessed with a variety of measures including the Child Behavior Checklist (Burns et al, 2004), diagnostic billing codes (dosReis et al, 2001) and lay administered diagnostic instruments (Garland et al, 2001; McMillen et al, 2004). Two studies that focused specifically on older youth have utilized psychiatric diagnoses measured with different diagnostic instruments as an indicator of mental health need (McMillen et al, 2004; Courtney, Terao & Bost, 2004). In the Midwest Study, the investigators used the Composite International Diagnostic Instrument (CIDI) to assess post- traumatic stress disorder, depression, anxiety disorders, and substance use disorders. They found that 31.4% of the study sample met criteria for a lifetime substance abuse or mental health disorder as measured in the study. Criteria for ADHD, conduct disorder, and oppositional defiant disorder were not assessed, however, so this number clearly underreports the number of youth who could be considered to have mental health disorders. In the Voyages study, the Diagnostic Interview Schedule was used to assess psychiatric disorders. They found that 61% of the sample had met criteria for a mental disorder in their lifetime, though this did not include substance use disorders (McMillen et al, 2004).

Mental health diagnosis has limits in terms of being a sole proxy for mental health need, especially among foster youth. The severity and associated functional impairment of a given mental disorder may vary widely across individuals who meet criteria for the same diagnosis (Spitzer, 1998). With such high rates of lifetime mental disorders among older foster youth, diagnosis alone conveys limited information about the range of severity among these youth or the

actual clinical presentation a psychiatrist may be assessing in order to make a decision to prescribe medication. Narendorf, Bertram, and McMillen (2012) found that the high-end youths in their study presented with complicated clinical presentations with overlapping diagnostic boundaries. Assessing diagnostic criteria alone failed to provide information that was useful in guiding treatment approaches for these youths. This is consistent with previous work on the diagnostic presentation of youth who have experienced trauma which can present in a constellation of symptoms that cross traditional diagnostic categories (Courtois, 2008).

The limits of diagnosis as an indicator of need may be particularly evident in the case of psychotropic medications for foster youth. Previous research has found evidence of prescribing that does not clearly fit with the recommended guidelines for a diagnosis. In analysis of polypharmacy in the Voyages data, Raghavan & McMillen (2008) found evidence of both potential under-prescribing and over-prescribing based on examination of the fit between diagnoses and prescribing. If we assume that a physician's decision to prescribe medications is in response to some symptoms or needs presented to them, the inclusion of other measures of need beyond diagnoses may help to understand prescribing. While guidelines for prescribing are generally centered on specific diagnoses (American Academy of Child and Adolescent Psychiatrists, 2007a-c), psychotropic medications are often used to target symptoms associated with a diagnosis (Bostic & Rho, 2006). Additional measures of mental health need beyond psychiatric diagnosis were included in this study to help understand why youth were taking medications and to examine patterns of medication use over time.

Symptoms relating to problems with regulating emotions may be particularly relevant for older foster youth. Emotion or affect dysregulation has been identified as one sequelae of child maltreatment which can result in significant problems in functioning into adulthood (Briere, 2009). It has been defined as "the inability to change or regulate emotional cues, experiences, actions, verbal responses, and/or non-verbal expressions under normative conditions" (Linehan, 2007, p.583). This underlying problem has been associated with both aggressive (Penney & Moretti,

2010) and self-injurious behavior (Linehan, 1993). While affect dysregulation among youth in the foster care system has not been well researched, it is likely that the behaviors associated with affect dysregulation may lead to more intensive interventions such as polypharmacy. This dissertation used a measure of affect regulation in combination with diagnostic measures as an additional indicator of mental health need.

The usefulness of individual diagnostic categories, themselves, has been questioned by some researchers due to the extensive co-morbidity across diagnostic categories (Pickles & Angold, 2003). Studies of child and adolescent mental disorders have consistently identified two major groupings of problems, designated as externalizing and internalizing (Achenbach, 1985; Achenbach & Edelbrock, 1979). Externalizing disorders include aggression, delinquent behavior and attention problems. Internalizing disorders include anxiety and depressive disorders. Even reducing down to these two dimensions, there is substantial co-morbidity across groups (Angold, Costello, & Erkanli, 1999). This study proposed to examine mental health need in relation to internalizing and externalizing problems, including measures of symptoms and functioning as well as diagnoses to capture these constructs.

Living Situations & Placement Changes

Another thing that sets foster youth apart from youth in the general population is the history of instability in their living situations. Older youth exiting foster care often have foster care experiences characterized by placement instability (Barth, 1990; Havlicek, 2010; McMillen & Tucker, 1999). Most recently, Havlicek (2010) found that a group of older youths from Illinois who participated in the Midwest study of former foster youths had an average of 8.3 placements over an average of 7.8 years in state care. In addition, youths with emotional and behavioral disorders (EBD) have been found to experience greater placement instability than their peers without EBD. Older youths with EBD are especially at risk because placement moves have been associated with older age (Barth et al, 2007). Placement instability is one contributing factor to discontinuities in psychiatric treatment which may result in medication changes or medication

additions and an accumulation of diagnoses and medications over time (McMillen et al, 2007). In a study using administrative data in Washington State, Garrison (2006) found that placement changes that involved a change in restrictiveness were associated with medication changes, however, lateral moves at the same level of restrictiveness were not. Given the high number of placement changes older foster youth experience and their influence on continuity of psychotropic treatment, placement changes will be examined as a covariate in identifying patterns of medication use.

The living situations of older youth also distinguish them from younger groups in the foster care system. These youth are more likely to live in residential treatment or group home settings than younger foster youth who are more likely to reside in non-kin family foster homes (Wulczyn et al, 2005). In the Voyages study of older foster youth, 40% of the youth were residing in these more restrictive living situations (McMillen et al, 2004). More restrictive living situations are generally associated with increased use of psychotropic medications (Breland-Noble et al., 2004; Lyons et al., 2004; Pavkov & Walrath, 2008). For example, one study of psychotropic medication use in therapeutic foster care and group homes found that 67% of the youth in therapeutic foster care and 77% of youth in group homes were prescribed a psychotropic medication. (Breland-Noble et al., 2004). In a study across 10 different mental health placement types along the continuum of care in New York, Lyons et al (2004) found psychiatric medication rates ranging from 30.2% of youth treated in clinic settings, to 87.6% of youth treated in state operated inpatient units (Lyons et al., 2004). Youth that reside at higher levels of restrictiveness also have higher levels of need so these findings are not unexpected. However, these settings may also provide access to medications through providers that identify their needs. For example, Warner et al (2007) found that over 90% of youth who had a psychiatric hospitalization were discharged on medications (Warner, Fontanella, & Pottick, 2007). This dissertation examined the role of mental health treatment settings as a mediator between needs and medication use.

Geographic Region

Psychiatric medication prescribing practices and the supply of mental health professionals have been found to vary across regions (Patel et al, 2005; Thomas & Holzer, 2006; Zito et al, 2003). The resources and practices of a region serve as enabling characteristics that can promote or inhibit access to care. Regional variation in rates of psychotropic prescribing has been identified in both studies using Medicaid data (Patel et al, 2005; Rubin et al, 2012; Zito et al, 2003) and the NSCAW data (Leslie et al, 2011; Raghavan et al, 2010). Recent work by Raghavan et al (2010) using wave 4 of NSCAW collected from 2002-2004, found nearly threefold variations in the probabilities of psychiatric medications between California and Texas, differences that could be accounted for in large part by differences in the evaluation of child characteristics in Texas. While older age and male gender were predictors of increased odds of medication use in most states, these factors were less predictive in Texas (Raghavan et al, 2010). In a study focused on smaller catchment areas in the NSCAW study, Leslie et al (2011) found 40 fold variation in the rates of medication use. Variables examined at the catchment level including county poverty, ratio of psychiatrists and pediatricians to the population, and linkages between child welfare and the mental health system failed to predict this variation. Though the current study contains youth from counties in only one state, variation within regions may still exist and will be included in models examining medication use patterns.

Gender

Differences in mental health treatment by gender are well established. In childhood, boys are more likely to receive treatment for externalizing disorders. This changes as youth transition into later adolescence and young adulthood where girls are more likely to receive treatment related to internalizing disorders (Cuffe et al, 2001). Findings across studies of psychotropic medication use in children and adolescents have consistently found that gender is associated with use. Boys are prescribed psychotropic medications at higher rates than girls (Leslie et al.,

2003, Patel et al, 2002; Patel et al, 2005; Raghavan et al, 2005; Thomas et al, 2006; Zito et al, 2003) by as much as 2:1. There is also evidence to support the fact that the size of the gender gap differs by medication type. In a study using Medicaid data, Zito et al (2003) found greater gender gaps in prescription of stimulants and smaller gaps in prescriptions of anti-depressants (Zito et al, 2003). In the Voyages study of older foster youth, however, gender was not a significant predictor of using multiple medications or discontinuing medications when leaving foster care (McMillen & Raghavan, 2009; Raghavan & McMillen, 2008). Gender was examined in this study as a potential predictor of medication use patterns over time and as a covariate in modeling paths to medication treatment.

Race

Race is a critical factor to consider in understanding medication use in older foster youth. It is well established that African American children are disproportionately represented in the child welfare system at multiple points from referral to placement in foster care (Belanger, Green & Bullard, 2008). What is less clear, is whether there are differences in the level of mental health need between African American and white youth. In analysis of the nationally representative National Survey of Child and Adolescent Wellbeing (NSCAW) that examined mental health need for all youth investigated in child welfare, Burns et al (2004) found no significant racial differences as measured by the Child Behavior Checklist, however, in a study of youth enrolled across five different systems of care including child welfare, African American youth were found to have lower impairment scores and lower proportion of DSM-IV diagnoses than white children (Leslie et al, 2003). Studies of older youth have found higher levels of mental health diagnoses among white youth. In the Voyages data, McMillen et al (2005) found that white youth had higher odds of meeting criteria for a mental disorder than youth of color and Garcia et al (2011) found a similar relationship in the Midwest study.

In both the Voyages study and the NSCAW study, the receipt of treatment did vary by race, even when controlling for need. In the Voyages study, youth of color were less likely to

have received inpatient psychiatry or outpatient therapy and more likely to have received residential or group care. They were also less likely to be receiving psychotropic medications (McMillen et al, 2004). These findings are consistent with other research that has consistently found lower rates of psychotropic medication use among African American youth (Ferguson et al, 2006; Han & Liu, 2005; Leslie et al, 2003; Raghavan et al, 2005; Ryan et al, 2008; Zito et al, 2003). The fact that the racial differences persist even when youth are removed from families raises questions about the drivers of the racial differences in prescribing. The differential rates of different types of service use may reflect different paths to medication treatment with African American youth more likely to get medication in association with residential placements and white youth more likely to get medication treatment directly, through connection with outpatient treatment or through psychiatric hospitalization. These hypothesized racial differences were explored in this study. In addition, the identification of mental health need by providers has been found to vary by race. In a study of youth involved in public systems in San Diego, African American youth with internalizing problems were less likely to receive mental health treatment but those with externalizing problems were more likely to receive treatment compared to their non-Hispanic white peers (Gudino et al, 2009). This dissertation study examined the relationship between mental health need and treatment, examining how youth of color and white youth with mental health need were differentially connected with services.

While it is well-established that youth of color have lower rates of psychotropic medication use, it is less clear whether the nature of treatment differs once youth are taking these medications. In a study comparing American Indian and Caucasian foster youth in Minnesota, Ferguson et al (2006) found that while rates of medication use were lower in the American Indian youth, the actual types of medications prescribed were similar across groups. In a study specifically designed to investigate racial disparities across youth in different Medicaid eligibility categories, Zito et al (2005) found differences by medication type. The greatest disparities were in anti-depressants, where white youth in the S-Chip category had odds 4.1 times greater of

getting an anti-depressant than black youth (Zito, Safer, Zuckerman, Gardner, & Soeken, 2005). In a study of use of anti-psychotic medications in Florida using Medicaid claims data, Robst et al (2009) found that while black youth were less likely to be prescribed anti-psychotic medications, once they were on the medications, their treatment patterns were similar to other racial groups (Robst, Armstrong, & Dollard, 2009). This dissertation study examined whether medication treatment patterns including type of medications prescribed and length of medication treatment differed by race.

Factors that May Influence Medication Changes

The following section discusses factors that may contribute to medication use patterns over time. When possible, issues specific to foster youth are discussed. Because of the paucity of data on medication changes and medication adherence that is specific to foster youth, data from the broader literature is introduced.

Medication Changes

Changes in psychotropic medication regimens are driven by both providers and consumers (child welfare workers, foster parents and the youth themselves). Medication changes in and of themselves are not inherently problematic. The challenges of treating adolescents with complicated clinical profiles such as the older foster youth population may require ongoing adjustments to medication regimens by psychiatrists. Some medications may only be required for a short period to stabilize a behavior and then be appropriately discontinued. Ideally, changes in medications are being driven by psychiatrists, however, in consultation with the youth and treatment team. Questions in the Voyages study asked youth to report on who made the decision to stop a medication and identify the reason the medication was stopped. This information provided some additional contextual information to examine in more detail what may

be driving a medication change and was used in this study to examine the circumstances of medication changes.

Some evidence also suggests, however, that prescribing practices for youth in foster care may be influenced by contextual factors rather than clinical need. Change in psychiatric provider has been identified as a potential driver of medication discontinuities in qualitative research where child welfare workers talked about the difficulties of finding a psychiatrist to serve their clients due to low Medicaid reimbursement rates and a shortage of psychiatrists (McMillen et al, 2005). These difficulties, combined with the frequent placement changes of these older youth, led to provider changes with little time to sift through complicated medication histories to determine the most appropriate course of treatment (McMillen et al, 2005). Psychiatrists, in turn, talked about the pressure placed on them by child welfare professionals to stabilize difficult behaviors with medication treatment in order to preserve placements (McMillen et al, 2007). Qualitative responses by youth in the Voyages study about their mental health treatment overall, reported negative experiences with medications in which they felt that psychiatrists were quick to prescribe medications without really listening or assessing their needs (Lee et al, 2006).

Youth that experience multiple changes in their medication regimens are having a different experience of medication treatment than youth who are stabilized on one medication over a long period of time. Medication changes initiated by providers may contribute to negative attitudes toward medication, a lack of confidence in this treatment, or recurrence of symptoms. There is limited evidence on this issue specific to foster youth, however, some evidence in adult populations suggests that medication switching by prescribers affects treatment compliance. Results from the Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE) in adults with schizophrenia found that switching medications contributed to early discontinuation of the medication (Essock et al, 2006).

Adherence

In addition to provider initiated medication changes, decisions by the youth themselves about whether to take medications influence medication use patterns over time. Medication adherence has been defined as the extent to which patients take medications as prescribed by their providers (Osterberg & Blaschke, 2005). In a synthesis of qualitative studies on a range of medication types, Pound et al (2005) found that psychiatric medications were described as both high benefit and high risk in that they produced noticeable benefits but had high associated risks of side effects and stigma. This finding is born out in studies of psychiatric medication use. While adherence to prescribed psychotropic regimens is associated with better outcomes, patient initiated discontinuation is common across both child and adult populations. In the CATIE study, 74% of patients discontinued use of antipsychotics within the 18 month period of the study (Lieberman et al, 2005). In a study using data from the Medical Expenditure Panel Survey, only 27% of those who initiated treatment for antidepressants continued for more than 90 days (Olfson et al, 2006). Adherence with medications has been noted to be especially problematic for adolescents and young adults (Cromer et al, 1989). One general population study in Canada found that youth ages 15-24 had odds 5.6 times greater of reporting non-adherence with psychotropic medication regimens than older adults (Bulloch & Patten, 2010). In previously reported results from the Voyages study, many youth stopped taking medications at their own initiation after exiting care (McMillen & Raghavan, 2009).

Attitudes

Attitudes and beliefs about mental health treatment overall, and psychotropic medications in particular, have been associated with engagement and adherence to treatment (Sajatovic et al, 2006; Scott & Pope, 2002). In a study of adults with mood disorders in a community mental health center, Sajatovic et al (2006) found that negative attitudes toward mood-stabilizing medications were associated with non-adherence with prescribed medication regimens.

Attitudes, in turn, have been found to be related to prior experiences of mental health services (Lee et al., 2006; Mojtabai, 2003; Schomerus et al., 2009). Prior experience with mental health treatment overall were associated with more positive attitudes toward seeking help in the National Comorbidity Study Replication (Mojtabai, 2003; Schomerus et al., 2009). In the Voyages study, youth were asked open ended questions about prior experiences with mental health providers which were coded into negative and positive responses. Those who reported only negative experiences with mental health treatment had significantly lower scores on a scale that measured attitudes toward mental health treatment at the start of the study. Twenty three percent of these negative comments centered on medication use specifically (Lee et al, 2006). This dissertation study assessed whether different medication use experiences were associated with attitudes toward medication. Negative attitudes may help explain why some youth with high needs are not on medications. Those youth who believe that medications are not helpful may be less likely to take them, even when provided with access to these medications.

The Unique Contributions of the Current Study

The review of literature in this chapter has made references to previously reported results of the parent Voyages study. This dissertation study built upon and extended prior results in several ways. The first aim tested a structural equation model of the paths associated with medication use, testing specific mediating relationships. Prior analyses examined correlates of service use at age 17 (McMillen et al, 2004) but did not examine the relationships between these services or hypothesize paths between them. The current study also extended the examination of racial differences in service use by re-conceptualizing the measurement of mental health need and examining mediating relationships between need and service use for each racial group.

In addition, this study built on previous longitudinal work that examined medication use as youth left care (McMillen & Raghavan, 2009). Knowing that medication use drops after youth leave care led to this study's focus on understanding what happens in the year before many

youth leave care. This study used new data extracted from paper history calendars to examine medication use patterns by month in the year from age 17 to 18 and characterize the changing nature of youths' medication regimens as they prepared to exit foster care.

The Current Study

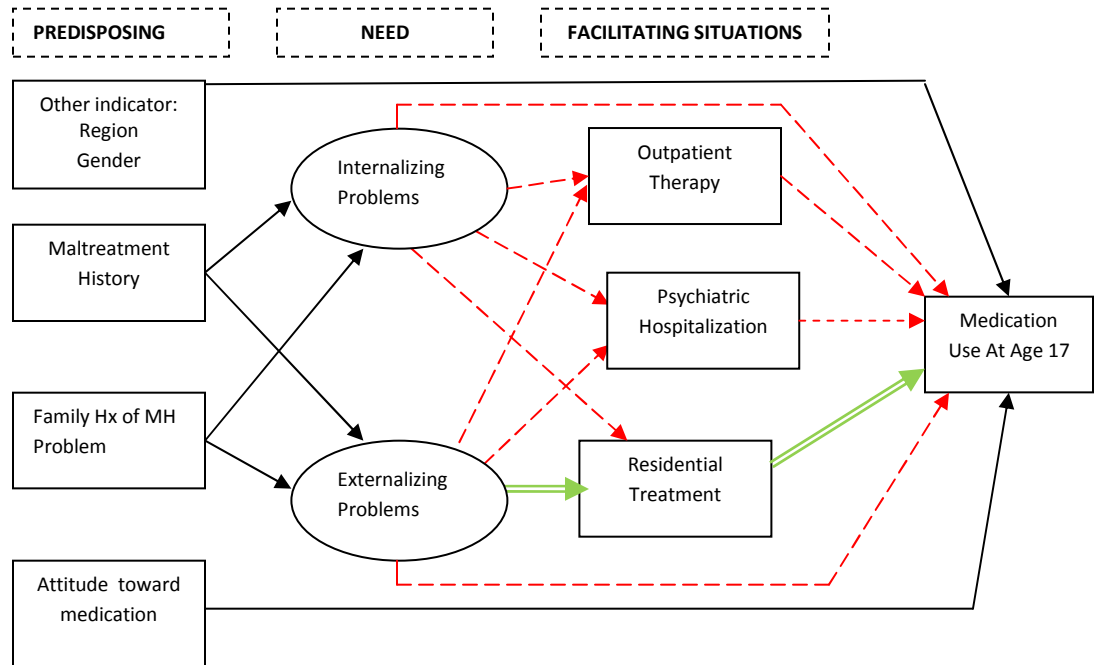
The current study integrated the theoretical and empirical work reviewed in this chapter in its aims and hypotheses. The constructs of the Andersen model served as a starting point for constructing a model to predict psychotropic medication use at age 17 (Figure 1). In examining the paths that led youth to psychotropic medication use while in foster care, known risk factors that have been associated with need for mental health services were included as predisposing characteristics. Severity of maltreatment history and the presence of a family history of mental illness are predisposing characteristics that were expected to be positively associated with a higher need for mental health treatment. Generally, in depictions of the Andersen model, enabling resources are the next construct examined. For the current study, however, several critical enabling resources were available to all youths. All youths in foster care have financing available to pay for their treatment through Medicaid and have caseworkers who should coordinate their care and facilitate access to services so these factors were not explicitly included in the model. Additional enabling resources such as the availability of care or transportation were not measured in the current study and could not be included in the model. Need, therefore, was the next critical component examined in order to understand how youth successfully access medication services. Need for treatment was broadly defined in this study as the presence of diagnosis, symptoms or behaviors that may result in medication treatment. These were initially conceived as internalizing and externalizing problems.

Need in the current study was assessed with interviewer derived diagnoses based on youth's self-report. Youth in foster care are dependent, however, on recognition of this need by gateway providers (including caseworkers, foster parents, mental health professionals) in order to

successfully access care. Drawing on the insights from the Gateway provider model, this study identified facilitating situations in which youth encounter providers who could identify their needs and direct them to services. Youth could be identified by their caseworkers or foster parents and directly linked with medication treatment. Youth's connection with medication treatment in the direct path from need was assumed to include the identification of this need by the caseworker or other involved supports such as foster parents or family members. Youth may also make their way to medication treatment through linkages with other types of mental health service providers such as therapists or social workers in residential or psychiatric facilities who are able to facilitate connection with medications. Youth who have been in outpatient therapy, residential treatment or psychiatric hospitals have been seen by mental health professionals who could recognize their need and link them to medications.

The hypothesized paths to medication treatment are presented in Figures 1. It was hypothesized that the lower rates of medication use by youth of color come from differences in recognition of need and referral to medication treatment by gateway and mental health providers. It was hypothesized that youths of color would have to reach higher levels of need prior to the recognition of this need by providers so the path coefficients would be stronger for youths of color than for white youths at several points in the model. Points at which the paths were expected to be significantly different are differentiated in each model by color and style. Green double lines indicate that the depicted racial group was expected have lower path coefficients. Red dotted lines indicate that the racial group was expected to have higher path coefficients. Based on previous research, it was hypothesized that compared to white youths, youths of color with internalizing problems would need to reach higher levels of need before being connected with any mental health service, including medications. For youths of color with externalizing problems, it was hypothesized that these problems would be most likely to lead to residential treatment and connection to medications would occur through residential treatment setting rather than other mental health treatment settings or direct connections with medications.

Figure 1: Model of Paths to Medication Treatment with Hypothesized Racial Differences



Dotted lines=lower in white youth, Double line=lower in youth of color,
Solid=no difference

The second and third aims for the current study were shaped by Pescosolido's concept of examining longitudinal "episodes" of service as a better method for understanding psychotropic medication use rather than utilizing cross-sectional measures. Aim 2 focused on characterizing the nature of these service episodes over a year for the sample as a whole. Previous research has identified racial disparities not only in access to care but in the quality and type of care (IOM, 2003) so it was hypothesized that even after youths had been linked to treatment, the nature of their service episodes would differ by race.

Aim three then moved to examining subgroups of service episodes and the characteristics and outcomes that were associated with different types. Predisposing and need characteristics as described in Aim 1 were used to examine the characteristics associated with identified subgroups. In addition, a longitudinal measure of placement changes was used to inform the modeling. Placement changes were included in this modeling process as a proxy for two of the concepts that Pescosolido identifies as influencing the service episode – the social support system and the treatment system. When a placement changes, the youth's entire context changes, including the people in the environment available to support the youth and the actual treatment providers that deliver services. These changes were expected to contribute to changes in medication regimens as new providers added to or discontinued previous medication regimens.

To create subgroups with distinct types of service episodes, number of medication changes was initially selected as the dependent variable. This was considered to be a key indicator of how youths were experiencing a service episode. While groups were allowed to emerge based on patterns in the data, it was hypothesized that there would be four groups of youths identified through this process. A majority of youths in the sample were not taking medications so these youths were expected to form one distinct group. In addition, many youths go off medications entirely as they age toward adulthood (Courtney et al, 2005; McMillen & Raghavan, 2008) and do not return to treatment so these discontinuers were expected to form another group. This group was expected to have less need compared to youths in other medication using groups. For some youths, medications were expected to be working well and

remain stable across the entire study period. These youths were expected to form another distinct group. Finally, a small group of youths was expected to be characterized by frequent changes. These youths were anticipated to be youths with high needs who would be most difficult to treat. Experiences of stability and continuity in treatment were expected to result in both better mental health outcomes and more positive attitudes toward mental health treatment in general.

Specific Aims & Hypotheses

Based on integration of empirical and conceptual work presented in this chapter, the study aims are presented again with associated hypotheses that derived from this work.

Aim 1: To examine the relationship of underlying risk factors (maltreatment & family mental health history), indicated need (mental health problems), and facilitating situations (mental health treatment) to the use of psychotropic medication in a cohort of 17 year old foster youths, focused specifically on understanding how these relationships perform differently for white youths and youths of color. A structural equation model was constructed and tested simultaneously for each racial group.

Hypothesis 1.1: The strength of the relationships between mental health need and mental health treatment (psychiatric hospitalization, outpatient therapy, residential treatment, and medications) will be significantly different for youths of color than for white youths. These relationships will differ by the type of disorder so that

1.1A: Youths of color with internalizing problems will have higher path coefficients for all paths from need to service use than white youths

1.1B: Youths of color with externalizing problems will have lower path coefficients to residential treatment and higher path coefficients to psychiatric hospitalization, outpatient therapy, and medication than white youths

Hypothesis 1.2: Other types of mental health service use (outpatient therapy, residential treatment and psychiatric hospitalization) will partially mediate the relationship between mental health need and medication use for all youths.

1.2A: Residential treatment will be a stronger mediator for youths of color

1.2B: Psychiatric hospitalization and outpatient therapy will be stronger mediators for white youths

Aim 2: To characterize longitudinal medication use episodes by examining patterns and circumstances of continuity and change in psychotropic medication use from age 17-18 and investigate how these patterns vary by race. Characterizing medication changes over time required examination of a number of indicators. This study documented: the average number of medications used each month, the number of medications added, the number of medications discontinued, the total number of changes over the time period, and the percentage who remained on the same medication regimen throughout the study. Bivariate analyses examined each of these changes by race.

Hypothesis: Since this aim was largely descriptive, no specific hypotheses were advanced.

Aim 3: To identify and characterize subgroups of youths with similar medication utilization patterns specifically accounting for race and explore the association of group membership with later outcomes.

3A. A latent growth model was used to identify classes of youths with different medication use patterns, including living situation as covariates

Hypothesis 3A: Among the patterns that emerge, it is likely that the following groups will emerge: 1) A group that was not using medications and remained off medications throughout the study period. 2) A group who started on medications but discontinued use 3) A group whose medication regimens were stable throughout the study period and 4) A group whose medication use was characterized by instability with multiple changes in medications

3B. To further understand subgroup composition, post hoc analyses examined characteristics associated with subgroup membership including race, gender, family mental health history, diagnoses, symptoms, functional indicators, maltreatment history, and the number of placement changes.

Hypothesis 3B: Youths who are in the high changing category will also be youth with the highest need and highest number of placement changes. Youth who discontinue are expected to exhibit lower levels of need.

3C. Analyses examined whether these subgroups were associated with mental health and functional outcomes and with attitudes toward mental health services at age 19.

Hypothesis 3C: Youths whose regimens are characterized by instability will have worse functional outcomes, higher ongoing mental health need and more negative attitudes toward mental health services than the other groups.

Chapter 3: Research Design and Methods

Overview

This chapter provides a description of the design and methods for the current study. The study involved two sets of analyses, one that examined medication use at the start of the Voyages study when all youths were 17 and a second set of analyses that examined subsequent medication use from age 17-18 for the subsample of youths that remained in foster care until age 18. The focus of the first set of analyses was examining the relationships between predisposing variables, mental health need, mental health treatment settings, and medication use. Initial analyses examined racial differences in the overall sample on the independent variables using chi-square and t-tests to test for significance. A path model was then constructed and the hypothesized relationships between these variables were tested. The path analysis was conducted simultaneously for youths of color and white youths using multi-group structural equation modeling in order to test differences in the hypothesized pathways between the two groups.

The second set of analyses examined the subsequent medication use patterns by month over the next year of the study. These aims were focused on characterizing medication use for these older youths during their time in the foster care system, so the sample was limited to youths who remained in care for the full year between ages 17 and 18. Aim 2 used descriptive analyses to examine medication use over this year for the sample, both overall and by medication class. Reasons for medication changes and who initiated the changes were also examined. Each of these descriptive statistics was then examined by race. A multivariable model was constructed to examine predictors of the number of medication changes. Aim 3 utilized a latent growth mixture modeling approach in order to identify subgroups of youths with similar medication use patterns. Analyses then focused on describing these groups in terms of covariates and associated outcomes at age 19.

Data Set & Sample

The data for this study came from the NIMH funded study “Mental Health Service Use of Youths Leaving Foster Care” (R01-MH-61404) which is referred to as the Voyages study. Youths were recruited for the study from the Missouri Children’s Division between December 2001 and May 2003. Participants were continuously enrolled over this period from a list of youths that would be turning 17 each month which was provided by the Children’s Division. Youths that lived in 8 counties including both the St. Louis metro area and rural Missouri were eligible for the study. Youths with IQs below 70 and youths that were on continual runaway status for more than 45 days were not eligible for the study. Of those who met criteria, 90% agreed to participate (n=404). Youths were interviewed in person at age 17 and age 19 and by phone every 3 months in between. Trained interviewers used a structured interview format that included standardized measures of service use and mental disorders (see p. 42) and completed life history calendars to visually capture significant events including medication changes. If youths missed an interview, the history calendar was utilized at the next interview to record information that had been missed. Over the study period, 80% of youths were retained in the study (n=325) and completed a final interview.

Analyses of paths to medication use at age 17 utilized the entire sample of youths who met eligibility criteria and were enrolled at the start of the study (n=404). For Aims 2 & 3, data from a subsample of youths was used. Because these aims were concerned with continuity and change in medications before youths exited foster care, the sample included only those youths in the original data set who remained in state custody until their 18th birthday and had complete data on medications (n=294). Many youths leave foster care at age 18, making the year prior to this exit an ideal period of study to inform transition planning. Data from age 17-18 was used to examine medication patterns and data at age 19 was used to examine later outcomes for those who completed the study.

Measures

Information on the measurement of the study variables is presented below (Table 1).

Detailed descriptions of the measures used for each of the variables are provided following the table.

Table 1: List of Variables

Construct/Variable Name	Definition, Level of Measurement, Categories	When measured?
Medication Use Variables		
Medication Use	Youths currently taking one or more psychotropic medications Dichotomous 1) yes 0) no	Age 17, Monthly Ages 17-18
Medication Additions	Number of medications added, by month and total; Count variable	Monthly Ages 17-18
Medication Discontinuations	Number of medications discontinued, by month and total; Count variable	Monthly Ages 17-18
Medication Changes	Number of additions + Number of discontinuations, by month and total; Count variable	Monthly Ages 17-18
Number of Medications	Number of medications at each study month	Initial, Age 17, Monthly Ages 17-18
Medication Duration by Type	Number of months on each type of medication; Count variable Number of months on each medication class; Count variable	Initial, Age 17, Monthly Ages 17-18
Medication Regimen Stability	Number of months where neither additions nor discontinuations were made for youths who are on medication Count variable	Monthly Ages 17-18
Decision to stop medications	Who made decision to stop Categorical: 1)doctor's, 2)mine, 3)someone else	Monthly Ages 17-18
Reasons for stopping medications	Reason for stopping each medication Categorical: 1)side effects 2)wasn't working, 3)cannot afford, 4)ran out, 5)don't know where to get it, 6)don't like taking meds, 7)other	Monthly Ages 17-18
Time Varying Predictor: Residential Placement		
Placement/restrictiveness	Type of living situation at each study month, created based on modified ROLES scale;	Age 17, Monthly

	Ordinal, values from 0 (homeless) – 7 (jail)	Ages 17-18
Demographic/Predisposing Characteristics		
Race	Dichotomous, Youths of color (1), White (0)	Age 17
Region	4 geographic regions – St. Louis City, St. Louis County, Outlying Counties, Southwest State Four dichotomous indicators, (1) yes (0) no	Age 17
Gender	Dichotomous, Female (0), Male (1)	Age 17
Maltreatment Physical Abuse Physical Neglect Emotional Abuse Sexual Abuse	Dichotomous indicator for each type of abuse, (1) yes (0) no	Age 17
Number of types of Maltreatment	Sum of physical abuse, physical neglect, emotional abuse, and sexual abuse Count variable	Age 17
Any Maltreatment	Dichotomous indicator if any type of abuse (1) yes, (0) no	Age 17
Family History of MH problems	Either parent had history of psychiatric treatment or family history of suicide Dichotomous indicator, (1) yes (0) no	Age 17
Need Variables		
Lifetime and Past Year Diagnoses: ADHD Disruptive Behavioral Disorder PTSD Depression Bipolar I	Dichotomous indicator for each diagnosis, (1) yes (0) no	Age 17
Affect Dysregulation in past 6 months	Numeric scale, range from 9-45	Age 17
Depressive symptoms in past month	Numeric Scale, values between 0-100, clinical cut off at 25 or greater for at least minimal depression	Age 17
School Problems	Count variable of # of school problem indicators: a. Ever expelled since 7 th grade b. Ever suspended since 7 th grade c. Skipped school in past year d. Verbal fights with teachers in past year e. Physical fights with teachers in past year f. Physical fights with students in past year	Age 17
Criminal Justice	Either In detention in past 12 months or ever arrested	Age 17

Involvement	Dichotomous (1) yes (0) no	
Facilitating Situations		
Residential Treatment	Youths stayed overnight in a residential treatment facility Dichotomous (1) yes (0) no	Age 17
Psychiatric Hospitalization	Went to psych hospital or emergency room for psychological problem in past 12 months Dichotomous (1) yes (0) no	Age 17
Outpatient therapy	Youths received outpatient help (not overnight) from a community mental health center or other outpatient mental health clinic in past 12 months or from a professional counselor	Age 17
Age 19 Variables		
Past Year Psychiatric Diagnoses: Depression Bipolar I Anxiety Post-Traumatic Stress Disorder Antisocial Personality Disorder	Whether youths met criteria for each disorder in past year Dichotomous, (1) yes (0) no	Age 19
Psychiatric Hospitalization	Went to psych hospital or emergency room for psychological problem in past 12 months Dichotomous (1) yes (0) no	Final
Depressive symptoms in past month	Numeric Scale, values between 0-100, clinical cut off at 25 or greater for at least minimal depression	Final
Attitudes toward seeking professional psychological help	Current Attitude toward mental health treatment Numeric scale, range from 0-36	Final
Attitude toward medication use	Medication single item indicator ordinal, 0-4 likert scale item	Final
Control Variable for Outcomes		
Child welfare status indicator	Indicator for whether youths was still in state custody, Dichotomous, (1) yes (0) no	Final

Dependent Variables

Aim 1

The dependent variable for Aim 1 was a dichotomous indicator of psychotropic medication use at the time of the first interview at age 17. Medication use was assessed using items from the Service Assessment for Children and Adolescents (Stiffman, 2000), medication module. Interviewers asked youths “How many prescription medications have you taken in the past month?” then proceeded through a series of questions that asked about each medication specifically. Any youth who reported using one or more medications was coded as 1 on the medication use indicator and youths who reported no medications were coded as 0.

Aim 2

This aim examined a number of different indicators to characterize medication use over the 12 month study period from age 17-18. New variables were created to quantify various indicators of medication use over time. Creation of these variables was possible due to the level of detail in the original Voyages survey items. As mentioned above, psychotropic medication use was initially measured at the first structured interview. The interview asked youths to report on the specific name of each prescription taken in the past month and how long they had been taking it. Medication bottles were used to verify the information when available. Subsequent interviews conducted by telephone every three months, inquired about medication changes with the question “The last time we talked, you were receiving (MED), are you still taking this?” The specific month the medication was stopped was recorded on the history calendar. If the youth was still taking the medication, the interviewer asked about continuous use of medication with the question “In what months did you regularly take this medication as prescribed?” This information was also recorded in the history calendar. Another series of questions asked youths to report on medications that had been added since the last interview. Interviewers recorded the name of each medication and this was also included on the history calendar. Utilizing these month by month reports enabled construction of change variables for each month of the study period as described below.

Medication Changes. To examine medication *changes* in detail, three new variables were constructed for each study month: 1) number of medication additions, 2) number of medication discontinuations, and 3) number of medication changes (including both additions and discontinuations). These monthly indicators were summed to examine the total number of medication additions, discontinuations, and changes over the 12 month period. Changes in dosage were not considered medication changes.

Circumstances of Medication Discontinuation. In order to characterize different types of medication changes, questions about the circumstances of medication discontinuations were examined. When medications were discontinued, interviewers asked the youths “whose decision was it to stop taking this medication?” Responses were coded into three categories: doctor’s (1), mine (2), or someone else (3) with an opportunity to fill in who that other person was. Youths were also asked “What was the reason for stopping the medication?” Responses were coded into the following categories: side effects (1), was not working (2), cannot afford (3), ran out (4), do not know where to get (5), do not like taking medications (6), and other (7) which was filled in by the interviewer. Responses related to access – could not afford, ran out, or do not know where to get them – were recoded into a single category for analyses. The “other” category was examined and additional categories were added for pregnancy or nursing, medication holiday, and no longer needed them. Due to the way these questions were asked and recorded, it was not possible to tie the questions to the specific medications as entered month by month. Instead, these variables were examined to provide descriptive information about medication changes overall in the sample.

Duration of medication use. The level of detail collected in the original Voyages study also enabled creation of variables to indicate the specific medications youths took at each month of the study. These data were used to create a variable for each medication that indicated how long the youth was on that medication during the study period. For example, if a youth was on paroxetine (Paxil) for 6 months and risperidone (Risperdal) for 8 months, two different variables were created with the values 6 and 8. These were used to examine the average length of time youths across the study took the medication such as the average length of time youth remained

on risperidone during the study period. Specific medications were grouped by medication type i.e. the average number of months youth remained on an antipsychotic during the study period.

In addition to information about the duration of specific types of medications, the study examined the amount of time youths spent on the same medication regimens. For this analysis, a variable was created for the number of months throughout the study period in which the youth was on a medication or group of medications and had no additions or discontinuations.

Medication Class. Medications were grouped into classes based on categories in the Red Book, a comprehensive list of drugs and their classifications (Red Book, 2003) and prior classifications in the dataset created in consultation with a psychiatrist. Identified medication classes were anti-depressants (subcoded into Selective Serotonin Reuptake Inhibitors (SSRIs), second generation (including SSNRIs such as venlafaxine (Effexor) and atypicals such as bupropion (Wellbutrin), and tri-cyclic), anti-anxiety (anxiolytics), anti-psychotics (subcoded into phenothiazine derivatives, thioxanethene derivatives, butyrophenone type, and atypical type), hypnotics, anti-manic/anti-convulsant/mood stabilizers (i.e. lithium, carbamazepine, topiramate, oxcarbazepine, valproic acid), stimulants/Attention Deficit Hyperactivity Disorder (i.e. ritalin/methylphenidate, dexadrine, dextroamphetamine, atomoxetine (Strattera)), alpha-agonists (i.e. tenex, clonidine, inderal atenolol), naltrexone, and anticholinergic drugs (i.e. benzotropine (Cogentin)). The main classes of focus for these analyses were anti-depressants, anti-psychotics, stimulants, and mood stabilizers as these were the most prevalent classes.

Number of Medications. Count variables were created with the number of medications youths were on at each month and the number of medication classes youths were on at each month.

Independent Variables

Predictors Measured at Age 17

The following predictors were measured at the initial structured interview at age 17. They were utilized in the path model for Aim 1 and as predictors in Aims 2 & 3.

Demographic/Predisposing Characteristics.

Race. Race was assessed with the question “How do you usually describe yourself in terms of race or ethnicity?” The majority of respondents identified themselves as African American (n=206) or White (n=178). Six respondents reported that they were of other races (3 American Indian, 1 Mexican, 1 Pacific Islander, 1 Middle Eastern) and 14 youths identified as bi-racial. All of these 20 youths were combined with African American youths for analyses of racial characteristics and described as “youths of color”. The approach follows precedent used in prior published work (i.e. McMillen et al, 2004) and was used in order to include all youths into groups of adequate size for analyses.

Geographic Region. Region was assessed based on the county in which the youth’s case originated which was coded prior to the interviews. These geographic regions represent the system that was responsible for overseeing the youth’s case and mental health services. Youths were not necessarily residing in these areas at the time of the interview since many youths lived in residential placements out of their native area. For most analyses, the eight counties were grouped into four different regions: 1) St. Louis City, 2) St. Louis County, 3) suburban counties adjacent to St. Louis which include Jefferson, Lincoln, St. Charles and Franklin counties, and 4) two counties in the Southwest region of the state (Jasper and Green). Low incidence variables such as history of bipolar I presented problems for model convergence when these were included in the multi-group structural equation model and in multinomial logistic regression analyses so region was further collapses to compare St. Louis City with all other regions.

Gender. Gender was pre-coded based on caseworker designations in case referral information.

Maltreatment History. Physical abuse, emotional abuse, and physical neglect were measured using the Child Trauma Questionnaire (Bernstein & Fink, 1998). The 15 item scale contains statements such as “When I was growing up, I didn’t have enough to eat” to which the respondent is asked to rate the veracity of the statement from *Never true* (1) to *Very often true* (5). A dichotomous indicator was created for each type of abuse based on cut off criteria set by Bernstein and Fink for moderate to severe abuse. Sexual abuse was measured based on three items from Russell (1986) which asked respondents whether 1) anyone had touched their private

parts against their wishes, 2) made them touch someone else's private parts against their wishes or 3) had vaginal, anal or oral sex against their wishes. A positive response to any of the three questions was coded as positive for sexual abuse. A count variable of number of types of maltreatment was also created based on previous research on the cumulative effects of abuse (McMillen et al, 2005). The count variable was used as a predictor in the path analysis in Aim 1. Post-hoc analyses of characteristics associated with subgroup membership in Aim 3 used the dichotomous indicators to examine each type of abuse separately as well as the count variable of number of types.

Family Mental Health History. Two items were used to create a dichotomous indicator of family mental health history. Youths were asked 1) whether their parents had a history of utilizing psychiatric treatment for an emotional problem such as anxiety or depression and 2) whether there is a history of suicidal behavior in the family. Youths were coded as having a family history (1) if they answered yes to either question.

Attitudes Toward Medications/Mental Health Services. Attitudes toward mental health services were measured using a modified version of the Confidence in Providers subscale of the Attitudes Toward Seeking Professional Psychological Help (ATSPPH) scale (Fischer & Turner, 1970). This scale asks questions such as "If I believed I was having a mental breakdown, my first thought would be to get professional attention." Respondents rated their level of agreement with each item on a 5 point scale from strongly disagree (0) to strongly agree (4). The nine items are summed for a scale range from 0-36. Modifications involved updating some of the language and adding the item "I think medication for emotional or behavioral problems can be helpful for many people." Analyses for Aim 1 examined scale values at age 17 to evaluate whether attitude about medication was associated with medication use. The medication item was examined as both a single item indicator and as a part of the overall nine item scale. The single item was dichotomized after examining its distribution into those who answered 0,1,or 2 (meds did not help) compared to those who answered 3 or 4 who agreed that medications can be helpful.

Need Indicators: Diagnosis, Symptoms, Functional Indicators

Psychiatric Diagnoses: The Diagnostic Interview Schedule (DIS-IV, Robins et al, 1995) was used to assign interviewer-derived diagnoses during the initial structured interview. This measure utilizes lay interviewers to assess diagnostic criteria based on DSM-IV (APA, 2000) using youths self-report. Lifetime and past year diagnoses of Attention Deficit Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder (ODD), Depression, Conduct Disorder (CD), Bipolar I (Manic Episode), and Post Traumatic Stress Disorder (PTSD) were assessed at age 17. Due to high comorbidity among conduct disorder and oppositional defiant disorder, these diagnoses were combined into a single indicator of disruptive behavioral disorder. Following a precedent used in other analyses of self-reported diagnoses (Teplin, 2002; McMillen et al, 2005), more relaxed diagnostic criteria for ADHD were used that do not require criteria for age of onset as youths are often unreliable in reporting exactly when symptoms began. Both lifetime and past year diagnoses were examined in bivariate analyses. For the purposes of characterizing mental health need, lifetime diagnoses were used as indicators. Lifetime measures were chosen to account for the fact that youths who are taking medications when stabilized may have no symptoms of a past year disorder.

Affect Regulation. The affect dysregulation subscale of the Inventory of Altered Self-Capacities measure (Briere, 2000) was administered in the initial interview. The nine item scale asks participants to respond to statements about themselves and their emotions based on how often they experienced problems in the past six months. For example, "Not being able to calm yourself down" with the response categories *Never* (1) to *Very Often* (5). Reliability for the scale in the current sample was good ($\alpha=.80$). While no clinical cut-off has been established for this scale, scale means have been reported for the general population ($M=11.24$ $SD=4.42$), a university student sample ($M=16.88$, $SD=7.57$), and a clinical sample ($M=21.45$, $SD=10.02$) (Briere, 2002). This variable was used as an additional indicator of mental health problems in the measurement model and as a predictor in analyses of class membership.

Current Depression. Symptoms of depression were assessed using the Depression-Arkansas Scale (D-ARK), an 11-item scale from the Depression Outcomes Module (Smith et al, 1994). Participants rated how often they experienced symptoms in the past four weeks using a response range from *Not at all* (1) to *Nearly every day for at least 2 weeks* (4). Although the D-ARK is less well known than other depression symptom measures, it has been shown to have excellent psychometrics and is easy to interpret. The questions map closely onto DSM-IV criteria for major depression with an additional item that asks specifically about suicidality. As recommended by the scale developers, the value was converted to a 100 point scale by rescaling values from 0 to 1, summing the items (range 0-33), then multiplying by constant (3.03). The D-ARK has been tested in culturally diverse populations and has been shown to have strong criterion validity as evidenced by high correlations with other commonly used measures such as the Beck Depression Inventory (Walter et al., 2003). Based on comparisons with the Beck Depression scale clinical cutoffs, scores from 0-25 indicate minimal depression, 26-37 mild, 38-57 moderate, and 58 or greater is considered severe. This scale was used as an indicator of recent depression to supplement the DIS-IV which assessed for lifetime and past year history of depression. The scale was administered both at age 17 and age 19.

Criminal justice. Youths were asked at the initial interview whether they had spent a night in a detention center or jail in the past 12 months and whether they had been arrested. A dichotomous indicator for criminal justice involvement was coded 1 if youths said yes to either question.

School problems. Dichotomous indicators for six questions were summed to create a count variable of school-related problems. The six indicators included whether youths had been suspended or expelled since the 7th grade, whether youths had been in verbal fights with teachers in the past year, whether youths had skipped school and whether youths had been in physical fights with teachers or with peers.

Facilitating Situations - Mental Health Service Use

Residential treatment. Youths were asked at the initial interview whether they had “stayed overnight in a Residential Treatment Center in the last 12 months?” Any youths who responded yes to this question were coded as having been in residential care (1) and all other youths were coded as no (0). Youths were asked a separate question specific to staying overnight in a facility for substance abuse problems. This was seen as fundamentally different from residential treatment so this question was not used as an indicator of residential treatment.

Psychiatric hospital contact. Youths were asked whether they had stayed “overnight in a hospital for emotional, behavioral, drug or alcohol problems” in the last 12 months using questions from the SACA (Stiffman et al, 2000). Youths were also asked whether they had “received outpatient help from an emergency room for behaviors and feelings” in the past 12 months. A dichotomous indicator was coded 1 if youths answer affirmatively to either question.

Outpatient therapy. Use of outpatient therapy in the past 12 months was assessed with two items from the SACA (Stiffman et al, 2000). Items asked youths whether they had received help for problems for behavior or feelings at an out-patient clinic or mental health center or from any professional like a psychologist, psychiatrist, social worker, or family counselor. A dichotomous indicator was coded 1 if youths answered affirmatively to either question.

Time-varying Predictor

In order to identify subgroups of youths with different patterns of medication use in Aim 3, one time-varying covariate was included in latent growth mixture models. Changes in residential situation have been associated with medication changes, so this was included specifically in the modeling process.

Residential Status/Placement Changes. Youths were asked where they were living at the start of the study and responses were coded into a categorical variable with 19 categories. Subsequent waves asked youths whether they had moved or had lived or stayed anywhere else since the last interview. These responses were recorded on the history calendar by month. For

this analysis, youth's residential status at each month of the study was recoded into a new ordinal variable using a restrictiveness indicator based on the Restrictiveness of Living Environment Scale (ROLES) (Hawkins et al, 1992). When youths had multiple placements in a month, the placement at the end of the month was used. The original ROLES measure is constructed on a scale from 0.5 to 10 with living completely independently rated as 0.5 and being in jail rated as a 10. The measure for this study maintained the restrictiveness order but eliminated categories that did not reflect the circumstances of the study population such as a wilderness camp and collapsed categories such as specialized foster care and regular foster care as this distinction was not measured in the original study. The new scale includes the following categories: homeless (0), independent living including job corps, college, or staying with a friend (1), biological parent home or kinship care home (2), non-kinship foster home (3), shelter (4), congregate care setting (5), psychiatric hospital (6), detention/jail (7). The measure was included as a time-varying covariate in modeling medication patterns for Aim 3 and had the advantage of conveying changes in placement and the restrictiveness of those changes.

Age 19 Variables: Diagnosis & Hospitalization

Psychiatric Diagnosis. The Diagnostic Interview Schedule was administered again at the final interview. Youths were assigned interviewer derived diagnoses based on their report of symptoms over the past twelve months. Diagnoses of anti-social personality disorder, generalized anxiety disorder, post-traumatic stress disorder, major depressive disorder, and bipolar I were assessed.

Psychiatric hospitalization. At age 19, youths were again asked whether they had stayed "overnight in a hospital for emotional, behavioral, drug or alcohol problems" in the last 12 months using questions from the SACA (Stiffman et al, 2000). Youths were also asked whether they had "received outpatient help from an emergency room for behaviors and feelings" in the past 12 months. A dichotomous indicator was coded 1 if youths answer affirmatively to either question.

Attitudes. The Attitudes Toward Seeking Professional Psychological Help scale (Fischer & Turner, 1970) with the modified items was again administered at the final wave of the study.

This variable was used to assess attitudes at age 19 controlling for attitudes at age 17. Attitude was used as an additional outcome measure for Aim 3 to examine whether medication use patterns were associated with changes in attitudes.

Child welfare custody status. At each interview, youths were asked whether they were still in care. A dichotomous indicator of custody status was created to reflect whether youth was in statute care at age 19. Administrative records were also used to verify this information and fill in for youths that were lost to follow-up. This indicator was used as a control variable in examining the relationship with later outcomes since custody status has been found to have an impact on a variety of outcomes (Courtney et al, 2007).

Depression Scale. The Depression Outcomes Module was administered again as previously described at Age 19. The rescaled scores were used in bivariate comparisons. Because the majority of youth were below the clinical cut-offs, a dichotomous indicator was created for those with scores below 25 and those at 25 or above who met criteria for at least minimal depression. This was used in logistic regression analyses to examine the relationship of medication class to depression at age 19.

Productively Engaged. Separate indicators asked youths whether they were currently working at age 19 and whether they were in high school or GED classes, college, or technical training. A dichotomous indicator of productively engaged was coded (1) if youths was either working or in any school and (0) if the youths was not engaged in any activity.

Data preparation.

Data for analysis of Aim 1 was accessed by using the full, publicly available dataset. For Aims 2 & 3, new data were abstracted from the original history calendars and merged into the existing data. The history calendars were used to guide data collection in the original interviews but were not fully data entered in the public dataset due to their complexity. During data collection, these calendars were used to assist in visually displaying key variables across multiple study waves. They contained separate rows for each variable with columns for each month of the study and notations each time changes were made (see Appendix A for example). For this study,

new variables were created in the dataset for each medication and each placement level by month from the data in these calendars. Data entry of the newly entered data was performed into Excel and a subset of 10% of cases was double checked for accuracy. Newly entered data was also checked against key variables in the source data and discrepancies were resolved by examining the original paper interviews. Data was imported into SAS 9.2 and restructured from long to wide format, then merged with the original dataset. Medications were then grouped into medication classes for each month and medication addition and discontinuation variables were created for each month. Uni-variate analyses examined the distribution of each of the study variables to ensure accuracy and gain greater familiarity with the data.

Analysis Plan

The aims for this analysis proceed in chronological order of measurement rather than by level of statistical sophistication. The study began by examining the use of psychotropic medications at the start of the study when all youths were age 17. Previous work has examined the predictors of medication use overall at age 17 (McMillen et al, 2004) so this analysis extended this work by testing a proposed model with hypothesized racial differences. Racial differences in the model predictors were examined to provide contextual information. A multi-group structural equation model was then constructed to test the specific paths that differed among these groups.

Aim 2 then followed the subset of these young people who remained in state custody until age 18 to descriptively characterize their medication use patterns over the subsequent year. Racial differences in medication use were examined bivariate, however, the primary objective of Aim 2 was to describe and characterize medication use for these young people between ages 17 and 18. Aim 3 then moved to an analysis of medication use patterns in order to identify subgroups using latent growth mixture modeling. Latent growth mixture modeling uses a person-centered approach to examine medication use patterns of individuals over time. Person-centered approaches focus on the relationship among individuals rather than the relationship among variables to capture population heterogeneity (Muthen & Muthen, 2000). The use of a person-

centered approach was designed to identify subgroups within the older foster youth population with distinct patterns of medication use.

Analyses included both structural equation modeling (Aim 1) and latent growth mixture modeling (Aim 3). Data management, bivariate analyses (Aim 2), and multivariable models were performed using SAS software [9.2] (SAS Institute, 2008) and Stata v11 (StataCorp, 2009). SEM and Latent Growth Modeling analyses were conducted using the MPlus software package, version 6.1. (Muthen & Muthen, 2010). The data used were a combination of binary, categorical, count, and continuous variables. MPlus is able to handle use of different types of variables in models together by using the appropriate estimators. The WLSMV (Weighted Least Squares estimator, Means and Variances adjusted) estimator was used for analysis of the measurement and structural model in Aim 1 and for the latent growth mixture modeling in Aim 3.

Data analysis: Aim 1

Aim 1: To examine the relationship of underlying risk factors (maltreatment & family mental health history), indicated need (mental health problems), and facilitating situations (mental health treatment) to the use of psychotropic medication in a cohort of 17 year old foster youths, focused specifically on understanding how these relationships perform differently for white youths and youths of color

Hypothesis 1.1: The strength of the relationships between mental health need and mental health treatment (psychiatric hospitalization, outpatient therapy, residential treatment, and medications) will be significantly different for youths of color than for white youths. These relationships will differ by the type of disorder:

1.1A: Youths of color with internalizing problems will have higher path coefficients for all paths from need to service use than white youths

1.1B: Youths of color with externalizing problems will have lower path coefficients to residential treatment and higher path coefficients to psychiatric hospitalization, outpatient therapy, and medication than white youths

Hypothesis 1.2: Other types of mental health service use (outpatient therapy, residential treatment and psychiatric hospitalization) will partially mediate the relationship between mental health need and medication use for all youths.

1.2A: Residential treatment will be a stronger mediator for youths of color

1.2B: Psychiatric hospitalization and outpatient therapy will be stronger mediators for white youths

For analysis of Aim 1, a structural equation modeling approach was used to test the proposed hypotheses. A structural equation model uses regression based techniques to test a theoretical model. It has advantages over an ordinary least squares regression model in that it is able to include measurement error in the model. In addition, the structural model is able to test multiple mediating relationships simultaneously in accordance with the hypothesized structure of the variables. This analysis fit a multi-group structural equation model (MSEM). MSEM was chosen due to its ability to test a theoretical model and how group status, in this case race, moderates all the relationships in the model (Scott-Lennox and Lennox, 1995).

Model Creation. Measurement Model Development

The measurement model was fit using confirmatory factor analysis in MPlus based on the conceptualization of mental health need as two latent constructs – internalizing and externalizing problems - with additional indicators of current symptoms included as previously described.

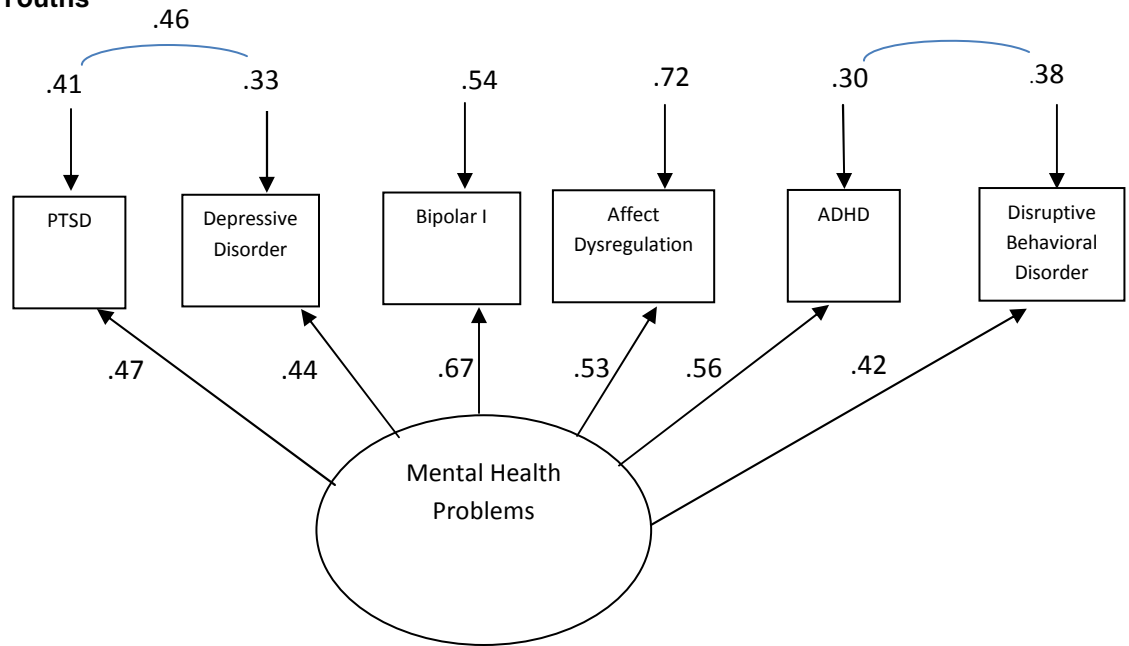
Model fit. Chi-square statistics were examined to assess the degree of correspondence between the co-variance matrix implied by the specified model and the actual covariance matrix observed in the data. Smaller values of chi-square indicate better fit. Models were fit to minimize chi square, however, chi-square values are susceptible to sample size so a significant chi square test was not used to eliminate a model when other fit indicators were acceptable. Other fit indicators were assessed based on criteria presented by Hu and Bentler (1999). RMSEA values below .06 were acceptable and CFI and TLI values close to 95 or greater were accepted.

The measurement model was run using the WLSMV estimator due to the categorical nature of the data. The model was fit to the data and indicators that did not load well were eliminated. These decisions were based on examination of model fit, path loadings that were close to the threshold of .30 and significantly lower than other loadings, and examination of whether the indicators were conceptually different (Comrey & Lee, 1992).

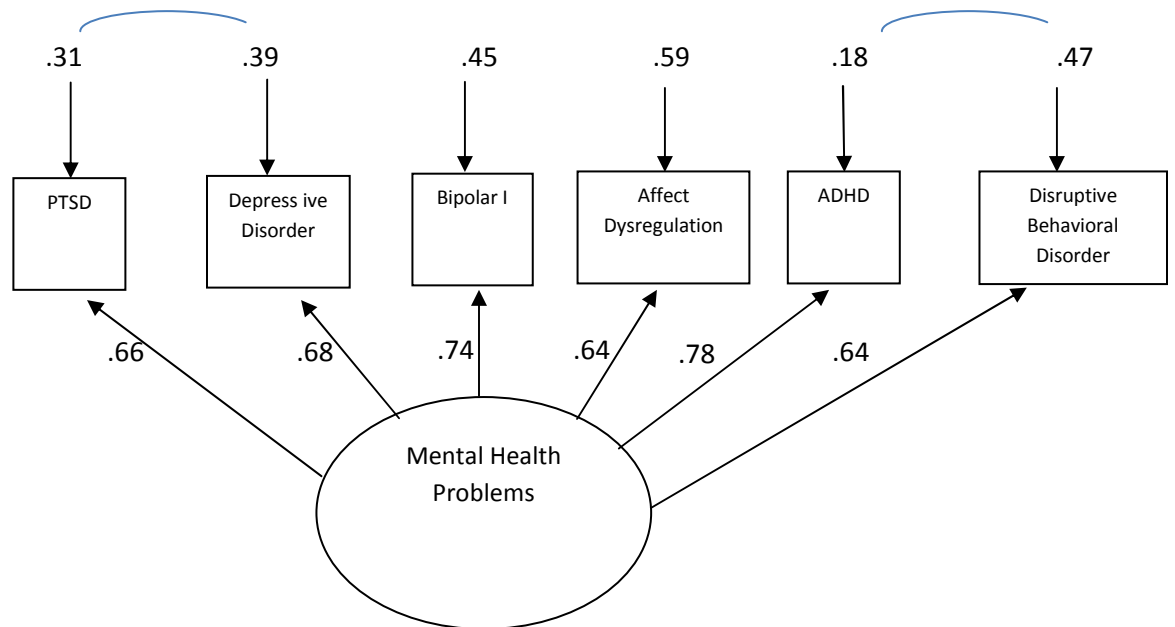
The hypothesized model of latent internalizing and externalizing disorders achieved good fit but there was a high correlation between the latent constructs ($r=.78$). When this model was used to fit the structural model, this high correlation resulted in inaccurate estimation of coefficients due to multi-collinearity. The problem became clear in analysis when the direction of some coefficients became negative in the full model when they had been positive prior to fitting the entire model. After statistical consultation, it was agreed that a simplified model with one latent construct would be more appropriate. This new model of one construct, mental health problems, was fit to include all diagnoses and the affect dysregulation scale (Figure 2). Modification indices suggested the need to include correlations between PTSD and depression and between ADHD and Disruptive Behavior. After adding these correlations, the model achieved good fit ($\chi^2=20.000$, $df=19$, $p=.40$; $RMSEA=.016$, $CFI=.997$, $TLI=.995$). A factor score for the value of the finalized model was generated and utilized in some later analyses for Aims 2 & 3. Due to sample size, the procedure of splitting the sample in half to test the new model was not feasible. These results should be considered exploratory rather than confirmatory and would need to be confirmed in future investigations.

Figure 2: Final Measurement Model for Aim 1

White Youths



Youth of Color



Model Fit Statistics:

$\chi^2=20.000$, $df=19$, $p=.3946$, $RMSEA=.016$ (.000-.065), $CFI=.997$, $TLI=.995$

The measurement model was fit across both groups simultaneously and then tested for measurement invariance (i.e. Kline, 2005). Measurement invariance establishes that the measure of mental health problems as modeled is actually operating in the same way for both white youths and youths of color. First, “configural invariance” was established by examining the pattern of fixed and estimated loadings. Next, “weak invariance” was established by constraining all factor loadings across the groups to be equal and assessing the model fit statistics. Finally, “strong factorial invariance” was established by constraining the intercepts/thresholds as well as the loadings to be equal. Strong factorial invariance achieved excellent model fit statistics that did not differ significantly from prior model fit so it was determined that the mental health problems construct was actually measuring the same thing in both groups. The strong factorial is the default in MPlus and was used as the basis for testing the structural model.

The structural model was built by adding variables into the model one at a time, then assessing for model fit as previously described and examining the modification indices. Exogenous variables, number of types of maltreatment and family history, were added into the model last. All constructs as originally proposed remained in the model except attitudes toward mental health services which was removed to improve model fit. Both the single item medication indicator and the full scale were tested but model fit was better without this construct included. Covariates were added to the core model by regressing all variables in the model onto each covariate, then the model was pruned by eliminating paths on covariates that were not significant.

In order to test for racial differences in the theoretically specified model, the multigroup model was fit with all parameters for both groups freely estimated. Next, each path between need, services, and medication was individually constrained to equality and tested one by one with re-analyses of model fit after each change. The “difftest” option in MPlus was used to test whether there was a significantly worse model fit when the paths were constrained.

Interpretation: Due to the presence of both a continuous latent construct and dichotomous independent and dependent variables, the structural model was estimated using

probit regression, the default procedure used by MPlus in these situations. Coefficients were standardized based on variance in both the latent and observed variables. This standardized coefficient represents the amount of change in an outcome variable per standard deviation unit of a predictor variable. They are values between zero and one and can be used to compare the relative strength of a relationship between two variables across the two racial groups.

Mediation: Mediation was tested in MPlus using the IND command to examine the indirect effect of mental health problems on psychotropic medications through each type of mental health treatment. A more rigorous test was also performed by running the model again using the bootstrap option and examining the significance of the indirect relationships.

Power Analysis: In order to determine the sample size needed to detect differences between the expected and actual covariance matrices, a power analysis was conducted prior to analysis using a procedure developed by MacCallum and colleagues (MacCallum et al, 1996). Power is estimated by effect size of the root-mean-square error of approximation (RMSEA) based on a null ($\epsilon_0=.05$) and alternative value ($\epsilon_a=.04$) of RMSEA for a given significance level ($\alpha=.05$). Given the sample sizes ($n=404$; $n=226$ of color, $n=178$ white) and estimated degrees of freedom (50), power for this analysis was found to be 84%. Additionally, an analysis was conducted to calculate the power to detect differences in path coefficients in the two models. It was found that there is 80% power to detect differences of 3 standard errors for any path coefficient.

Missing Data. There were very low rates of missing data in the sample at age 17 due to the study procedures which called for re-contacting subjects when questions were missed due to interviewer error. In a small number of cases, the interview subject stopped the interview prior to the diagnostic portion of the interview ($n=3$). Diagnoses were imputed for these cases using a single imputation procedure in IVEware which uses a multivariate sequential regression approach (Raghunathan et al, 2001) to estimate missing values.

Data analysis: Aim 2

Aim 2: To examine patterns and circumstances of continuity and change in psychotropic medication use over one year in a cohort of older foster and investigate how these patterns vary by race

In order to better understand medication use over the study period, medication use was examined in multiple ways in Aim 2. Univariate analyses examined frequencies and means for:

- a) average number of medication changes over the entire study period, examining both total changes, number of discontinuations and additions. A medication change was defined as a change in the type of medication, not a change in the dosage or route of administration.
- b) average length of time on each medication including the average amount of time for specific medications. Average time was examined both for all youths who took a medication and for youths who started the study on a medication
- c) average length of time on the same medication regimen (i.e. no changes)
- d) number of medications during each month across the study period
- e) average number of medication classes each month across the study period
- f) average number of different medications taken over the period
- g) percent of sample remaining on the same medication(s) for the entire year.

Youths were also grouped into medication use patterns defined as:

- a) continuous users – those who started the study on medications and stayed on a medication the entire time
- b) initiators – those who were not on a medication at baseline but started on a medication during the study period
- c) discontinuers – those who started the study on a medication and stopped at some point during the year
- and d) intermittent users who went on and off medications several times through the study year.

The following medication classes were used as the primary targets of investigation: stimulants, antipsychotics, antidepressants, and mood stabilizers. To better understand the reasons for medication changes, bivariate analyses examined changes across the year by who initiated the changes and reason for the change.

To examine medication use patterns by race, bivariate analyses (chi-square tests, t-tests) examined race and each of the medication continuity indicators described above. Due to the high number of comparisons, the likelihood of finding a significant finding due to chance alone is

heightened. Bonferroni correction methods were considered to control for the increased likelihood of making a Type I error when making multiple comparisons, however, the extremely stringent nature of this correction along with the relatively small size of this sample made this an unrealistically stringent test (Perneger,1998).

To further examine the phenomenon of medication changes, a negative binomial regression analysis was conducted, using the count of medication changes as the dependent variable. Only youths that had been on a medication during the study period were included. Visual examination of the distribution of the medication change variable compared to a poisson and a negative binomial distribution were conducted in Stata which verified that the negative binomial distribution was most appropriate. Due to the size of the sample for this analysis (n=124), the mental health problems factor score generated in Aim 1 was used as the sole indicator of mental health need. Dichotomous indicators were used for region (St. Louis City compared to all others) and maltreatment (any vs. none).

Data analysis: Aim 3

Aim 3: To identify and characterize subgroups of youths with similar medication utilization patterns specifically accounting for race and explore the association of group membership with later outcomes.

3A. A latent growth model was used to identify classes of youths with different medication use patterns, including living situation as covariates

Hypothesis 3A: Among the patterns that emerge, it is likely that the following groups will emerge: 1) A group that was not using medications and remained off medications throughout the study period. 2) A group who started on medications but discontinued use 3) A group whose medication regimens were stable throughout the study period and 4) A group whose medication use was characterized by instability with multiple changes in medications

3B.To further understand subgroup composition, post hoc analyses examined characteristics associated with subgroup membership including race, gender, family mental health history, diagnoses, symptoms, functional indicators, maltreatment history, and the number of placement changes.

Hypothesis 3B: Youths who are in the high changing category will also be youth with the highest need and highest number of placement changes. Youth who discontinue are expected to exhibit lower levels of need.

3C. Analyses examined whether these subgroups were associated with mental health and functional outcomes and with attitudes toward mental health services at age 19.

H3C: Youths whose regimens are characterized by instability will have worse functional outcomes, higher ongoing mental health need and more negative attitudes toward mental health services than the other groups.

Analyses in Aim 3 focused on identifying subgroups of youths with similar medication use patterns. To characterize groups of youths with similar experiences, person-centered methods such as latent growth mixture modeling were chosen as they allow for assignment of individuals into distinct classes (Muthen & Muthen, 2000). Examination of variation both between and within these classes allowed for characterization of meaningful typologies of people (Roesch et al, 2010). Latent growth mixture modeling examines intra-individual change over time while acknowledging the potential for existence of subpopulations of youths with a different distribution than the overall population (Connell & Frye, 2006; Hoeksma & Kelderman, 2006).

Creation of Latent Growth Mixture Model

In order to test the proposed hypotheses and classify youths by medication change patterns, several different variables were examined for use as the dependent variable including a count of medication changes each month, a dichotomous indicator of medication change for each month, and a count variable of the number of medications for each month. Growth plots were examined and models were tested using the MPlus software. The count of medications by month was determined to be the most appropriate indicator as these patterns provided some indicator of medication changes and also provided information about the complexity of youth's medication regimens. A model was created fitting this variable as a continuous variable. The process of fitting the model involved first examining an unconditional model with no covariates, then adding a time-varying covariate of living restrictiveness. Inclusion of race as a covariate was considered but medication use groups no longer made conceptual sense after race was included. After statistical consultation, latent growth mixture modeling was used to create subgroups first and race was examined for its association with these patterns after subgroup identification.

To establish the growth curves for the individual groups, the intercept parameter (the number of medications measured at baseline) and the slope parameter (mean and variance in the number of medications over 11 subsequent months) were regressed on a categorical latent trajectory class variable representing unobserved groups of youths with similar slope and intercept parameters. To create the model that would effectively converge, a value of 5000 starts and 50 sets of final optimizations was specified and a value of 20 iterations was used. This generated 5000 sets of randomly generated starting values which were used through 20 iterations for the process of optimization. The ending values from the best optimizations (highest log likelihoods) were used in fifty final stage optimizations (Muthen & Muthen, 2007).

Model selection. A series of 2, 3, 4, and 5 class models were tested and model fit indices were examined. The Akaike Information Criterion (AIC) and Standardized Bayesian Information Criterion (SBIC) model fit indicators were examined to determine the best fitting model (lowest is best) and the Entropy value was also examined (highest is best). AIC and SBIC are criterion for selecting among a finite number of models based on the number of parameters in the model using the likelihood function. Entropy is a measure of how many individuals in the sample were likely to be correctly classified and values over .90 were considered to be strong (Roesch, Villodas & Villodas, 2010). In addition, the identified groups were examined with regard to categories that made conceptual sense and produced classes that were big enough to support further testing.

Assignment of Classes

A probability of being assigned to each class was generated by MPlus for each subject. Across the sample, the certainty of assignment to each class was high. Given these levels of certainty in class assignment, the decision was made to assign individuals to a class for the rest of the analyses without any weighting.

Aim 3B: Covariates of class membership.

After youths were assigned to classes, covariates of class membership were examined through bivariate and multivariable regression models to test the proposed hypotheses. Multinomial logistic regression was used at both the bivariate and multivariate levels because it allowed for analysis of pairwise comparisons of membership in each group while accounting for the presence of the other groups. Multinomial logistic regression models were estimated for each variable separately using exact logistic regression to handle problems with quasi separation. Multivariable models were unable to be estimated using exact methods due to their size but were estimated with maximum likelihood methods.

Testing Assumption of Independent Irrelevant Alternatives

Prior to fitting the multinomial regression model, the Hausman and the Small-Hsiao tests were examined to test the assumption of independent irrelevant alternatives. These tests assess whether the ratio of probabilities of being assigned to any two alternatives is independent of a third choice. For example, the ratio of the probability of being assigned to the low use group compared to the no use group would not change if an additional medication use class were introduced. The Small-Hsiao test utilizes randomly selected subsamples and is thus very influenced by the size of the sample (Small & Hsiao, 1985). Given the relatively small sample overall and the small number of cases in one of the categories, the Hausman was deemed the most appropriate test. The Hausman test recommended accepting the null hypothesis that the groups are independent so the assumption for proceeding with multinomial logistic regression was met.

Multivariable Model Creation

The multivariable model was fit with a subset of the covariates examined bivariate. Given the small size of one of the groups, covariates with little variation were eliminated or collapsed. Bipolar I and depressive disorders were combined into a single category indicating mood disorders. Post traumatic stress disorder was eliminated from analyses given its small size and the fact that medication is not recommended as a first line treatment for this disorder.

Aim 3C: Relationship Between Medication Use Subgroups And Age 19 Outcomes.

The association between medication use class membership and outcomes at age 19 was examined using logistic regression for categorical outcomes. Relationships were first examined bivariate and tested using exact multinomial logistic regression. Multivariable regression models were created to further assess relationships that were found to be significant at the bivariate level and were of conceptual interest. A logistic regression model was fit to assess the impact of class membership on being engaged in school or work at age 19, while controlling for race, gender, having left state custody, depression scale, any diagnosis, and current medication use. Classes were dummy coded and the medium use group was used as the reference category. A second logistic regression was also fit with the same variables for the dichotomous indicator of depression based on the depression scale.

Missing Data. At age 19, 12% of cases in the subsample did not complete an interview (n=34). These cases were examined to assess whether they were different from the sample with complete data. Youths who were missing were more likely to have a history of physical abuse, a prior diagnosis of conduct disorder, a history of involvement with the criminal justice system, and were more likely to be white and not living in St. Louis City. These youths were also more likely to have left state custody. Because these missing data were due to attrition from the study and they had not completed final interviews, these cases were eliminated from analysis rather than imputed. Data was not missing at random so the results of the outcome analyses are likely biased due to this pattern of missingness and should be interpreted with this in mind.

Chapter 4: Results

The results section begins with descriptive information about the overall sample. A comparison of the full sample which was used in Aim 1 with the subsample that was used in Aims 2 & 3 is presented. Next, descriptive statistics about the racial differences in the sample overall are presented using the covariates to be tested in the structural equation model. These introductory analyses lay a foundation for understanding the analyses presented subsequently for each of the aims.

Background Analyses

Sample Characteristics

Sample characteristics for both the overall sample for Aim 1 and the subsample for Aims 2 & 3 are presented in Table 2. The two samples were very similar in their characteristics. None of the differences in the two samples were statistically significant. Both samples were majority female. The subsample had a slightly higher proportion of youths of color - 61% compared with 56% in the full sample. In both samples, approximately 35% of the youths were taking a psychotropic medication at the start of the study at age 17. Lifetime rates of psychiatric disorders ranged from 45% of youths who endorsed a disruptive behavioral disorder to 6% of youths who endorsed symptoms consistent with bipolar I disorder.

Table 2: Sample Characteristics for Full Sample (Aim 1) and Sub Sample (Aim 2 & 3)

	All Youths at Age 17 n=404, %	Subsample in Care 17-18 n=294, %
Race		
White	178 (44)	114 (39)
Of-Color	226 (56)	181 (61)
Gender		
Male	178 (44)	128 (43)
Female	226 (56)	167 (57)
Living Situation		
Bio parent	33 (8)	13 (4)
Other relative	74 (18)	56 (19)
Foster home	116 (29)	88 (30)
Congregate care	168 (42)	131 (44)
More independent	13 (3)	7 (2)
Geographic Region		
St. Louis City	142 (35)	120 (41)
St. Louis County	120 (30)	89 (30)
Southwest Missouri – Jasper, Green	82 (20)	52 (18)
Jefferson, Lincoln, St. Chas, Franklin	60 (15)	34 (12)
Lifetime Mental Disorders		
Depression	108 (27)	79 (27)
Bipolar I	24 (6)	18 (6)
Post-Traumatic Stress Disorder	57 (14)	45 (15)
Attention Deficit Hyperactivity Disorder	82 (20)	59 (20)
Disruptive Behavioral Disorder (ODD or CD)	184 (46)	131 (45)
Past Year Mental Disorders		
Depression	71 (18)	53 (18)
Bipolar I	21 (5)	15 (5)
Post-Traumatic Stress Disorder	28 (7)	23 (8)

Attention Deficit Hyperactivity Disorder	44 (11)	33 (11)
Disruptive Behavioral Disorder (ODD or CD)	63 (16)	43 (15)
Maltreatment		
Physical Abuse	186 (46)	141 (48)
Sexual Abuse	141 (35)	103 (35)
Physical Neglect	186 (46)	141 (48)
# Types of Maltreatment		
0	118 (29)	81 (27)
1	126 (31)	93 (32)
2	93 (23)	71 (24)
3	67 (17)	50 (17)
Family History of Mental Disorder	206 (51)	151 (58)
Mental Health Treatment		
Past Year Psychiatric hospitalization	59 (15)	42 (14)
Past Year Outpatient therapy	210 (52)	151 (51)
Current Psychotropic Medication	146 (36)	102 (35)

Racial Differences

The characteristics of youths on each of the independent and dependent variables were examined by racial group for the full sample at wave 1 (Table 3). White youths were significantly more likely to have three or more types of maltreatment, to have family histories of mental illness, and to have lifetime histories of all types of disorders. While rates of psychiatric hospitalization and residential treatment were similar across the groups, white youths were significantly more likely to receive outpatient therapy and psychotropic medications. Overall, 47.2% of youths in the white group received medications compared to 27.4% of youths of color.

Table 3: White Youths and Youths of Color Compared Across Covariates

	White Youths n=178, (%)	Youths of Color n=226,(%)
Gender		
Female	99 (55.6)	127 (56.2)
Living Situation		
Bio parent	20 (11.2)	13 (5.8)*
Other relative	26 (14.6)	48 (21.2)
Foster home	70 (39.3)	46 (20.4)****
Congregate care	58 (32.6)	110 (48.7)***
More independent	4 (2.3)	9 (4.0)
Geographic Region		
St. Louis City	14 (7.9)	128 (56.6)****
St. Louis County	39 (21.9)	81 (35.8)**
Southwest Missouri	71 (39.9)	11 (4.8)****
Jefferson, Lincoln, St. Chas, Franklin	54 (30.3)	6 (2.7)****
Past Year Mental Disorders		
Depressive	33 (18.6)	38 (16.8)
Bipolar I	9 (5.1)	12 (5.3)
Post-Traumatic Stress	15 (8.5)	13 (5.8)
Attention Deficit Hyperactivity	45 (25.4)	37 (16.4)*
Disruptive Behavior	29 (16.4)	34 (15.0)
Lifetime Mental Disorders		
Depressive	56 (31.6)	52 (23.0)*
Bipolar I	10 (5.7)	14 (6.2)
Post-Traumatic Stress	32 (18.0)	25 (11.1)*
Attention Deficit Hyperactivity	45 (25.4)	37 (16.4)*
Disruptive Behavioral	95 (53.7)	89 (39.4)**

Symptom/Functional Indicators		
Affect Regulation Scale Mean (SD)	21.8 (8.5)	22.2 (8.6)
Depression Scale Score Mean (SD)	16.3 (15.0)	17.9 (18.1)
% in Clinical Range (>25)	36 (20.2)	59 (26.1)
School Problem Count (SD)	1.9 (1.3)	1.8 (1.3)
Criminal Justice Involvement	96 (53.9)	93 (41.2)**
Maltreatment		
Physical Abuse	91 (51.1)	95 (42.0)
Sexual Abuse	71 (39.9)	70 (31.0)
Physical Neglect	87 (48.9)	99 (43.8)
# Types of Maltreatment		
0	49 (27.5)	69 (30.5)
1	47 (26.4)	79 (35.0)
2	44 (24.7)	49 (21.7)
3	38 (21.4)	29 (12.8)*
Family History of Mental Disorder	111 (62.4)	95 (42.0)****
Attitude toward MH Services		
Overall Scale Mean (SD)	2.4 (.6)	2.3 (.6)
Dichotomized med item – Meds help	107 (60.1)	103 (45.6)**
Mental Health Treatment		
Past Year Psych hospital or ER	38 (21.4)	35 (15.5)
Past year residential treatment	81 (45.5)	110 (48.7)
Past Year Outpatient therapy	110 (61.8)	100 (44.3)***
Current Psychotropic Medication	84 (47.2)	62 (27.4)****

* $p<.05$, ** $p<.01$, *** $p<.001$

Results of Aim 1: Paths to Medication Use

Aim 1: To examine the relationship of underlying risk factors (maltreatment & family mental health history), indicated need (mental health problems), and facilitating situations (mental health treatment) to the use of psychotropic medication in a cohort of 17 year old foster youths, focused specifically on understanding how these relationships perform differently for white youths and youths of color.

Hypothesis 1.1: The strength of the relationships between mental health need and mental health treatment (psychiatric hospitalization, outpatient therapy, residential treatment, and medications) will be significantly different for youths of color than for white youths. These relationships will differ by the type of disorder:

1.1A: Youths of color with internalizing problems will have higher path coefficients for all paths from need to service use than white youths

1.1B: Youths of color with externalizing problems will have lower path coefficients to residential treatment and higher path coefficients to psychiatric hospitalization, outpatient therapy, and medication than white youths

Hypothesis 1.2: Other types of mental health service use (outpatient therapy, residential treatment and psychiatric hospitalization) will partially mediate the relationship between mental health need and medication use for all youths.

1.2A: Residential treatment will be a stronger mediator for youths of color

1.2B: Psychiatric hospitalization and outpatient therapy will be stronger mediators for white youths

Following preliminary descriptive analyses, the structural equation model was fit to the data. The mental health problems latent variable was created as previously described in the methods section and used as the sole indicator of need in the structural model. The study hypotheses are referenced above. Results are presented in figures for each racial group then comparisons between the groups are presented. As discussed in the methods section, the high correlation between internalizing and externalizing disorders led to the inability to model these constructs separately. Hypotheses related specifically to internalizing and externalizing disorders (H1.1A & H1.2A), therefore, were not tested.

Structural Equation Model

Results of the proposed model of the relationships between predisposing risk factors, mental health problems, other mental health treatment, and medication use controlling for demographic covariates are presented in Table 4. The final model was similar to the proposed model with two exceptions that were previously discussed: mental health problems were modeled as a single construct and attitudes toward mental health services was eliminated. The final model fit was acceptable (Hu & Bentler, 1999). The chi-square test was not significant ($\chi^2=159.093$, $df=135$, $p=.07$), RMSEA was below .05 (.030, CI:.000-.047), and CFI and TLI were above .95 (CFI=.966, TLI=.954).

Table 4: Multigroup Structural Equation Model

Measurement Parameters	λ (se)	Z	Standardized	b(se)	Z	β (standardized)
White Group						
Measurement Model						
Mental Health Problems						
Depression	.47(.10)	4.61***	.50			
PTSD	.48(.09)	5.44***	.52			
Disruptive Behavior	.42(.10)	4.07***	.45			
ADHD	.57(.09)	6.49***	.61			
Bipolar I	.57(.12)	4.86***	.62			
Affect Dysregulation	.49(.05)	10.44***	.57			
Depression w. PTSD	.30(.12)	2.45**	.30			
ADHD w. Disruptive	.28(.11)	2.47*	.28			
Structural Model						
MH Problems→Maltx				.35(.10)	3.67***	.36
MH Problems→Fam hx				.07(.24)	.24	.03
Psych_ER→ MH Problems				.27(.13)	2.13*	.29
Rescare→MH Problems				.39(.10)	3.81***	.40
Outpt Ther → MH Problems				.22(.12)	1.88	.24
Meds→ MH Problems				.44(.11)	3.90***	.47
Meds→ Psych_ER				.10(.13)	.78	.10
Meds→ Rescare				.17(.11)	1.48	.17
Meds→ Outpt therapy				.37(.11)	3.43**	.37
Psych_ER with Rescare				.28(.13)	2.21*	.28
Rescare with Outpt therapy				-.26(.11)	-2.29*	-.26
Outpt therapy w. Hospital_ER				.08(.13)	.63	.08
Maltx w Fam Hx				.07(.15)	.47	.13

Youths of Color Group			
Measurement Model			
Mental Health Problems			
Depression	.47(.10)	4.61***	.72
PTSD	.48(.09)	5.44***	.74
Disruptive Behavior	.42(.10)	4.07***	.67
ADHD	.57(.09)	6.49***	.71
Bipolar I	.57(.12)	4.86***	.83
Affect Dysregulation	.49(.05)	10.44***	.61
Depression w. PTSD	.02(.06)	.37	.02
ADHD w. Disruptive	.10(.08)	1.30	.10
Structural Model			
MH Problems→Maltx	.41(.11)	3.64***	.34
MH Problems→Fam hx	.55(.54)	1.02	.47
Psych_ER→ MH Problems	.69(.07)	9.72***	.79
Rescare→MH Problems	.40(.08)	4.75***	.47
Outpt Ther → MH Problems	.32(.08)	3.92***	.35
Meds→ MH Problems	.40(.10)	3.97***	.47
Meds→ Psych_ER	.27(.07)	3.62***	.28
Meds→ Rescare	.02(.09)	.22	.02
Meds→ Outpt therapy	.13(.09)	1.44	.13
Psych_ER with Rescare	.19(.09)	1.88	.19
Rescare with Outpt therapy	.08(.10)	.81	.08
Outpt therapy w. Psych_ER	-.06(.10)	-.55	-.06
Maltx w. Fam hx	.07(.14)	.47	.20

$\chi^2=159.093$, $df=135$, $p=.07$; RMSEA=.030 (.000-.047); CFI=.966, TLI=.954

* $p<.05$, ** $p<.01$, *** $p<.001$

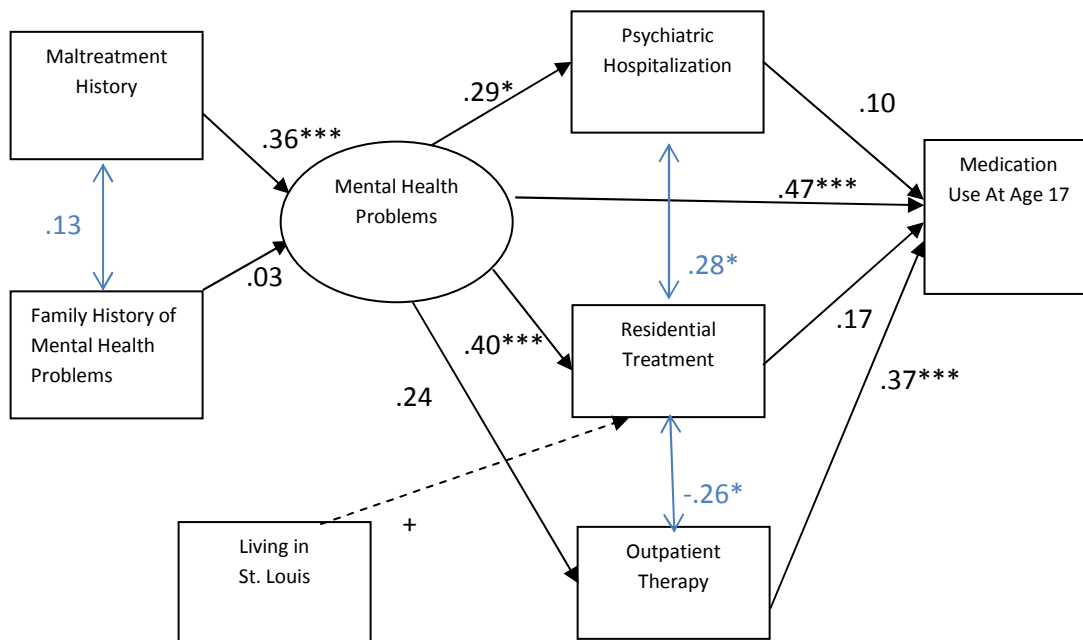
Abbreviations: MH Problems=Mental Health Problems, Maltx= Maltreatment History, Fam Hx=Family History, Psych_ER=Psychiatric Hospital or Emergency Room, Rescare=Residential Treatment, Outpt Ther=Outpatient Therapy, Disruptive=Disruptive Behavioral Disorder, ADHD=Attention Deficit Hyperactivity Disorder, PTSD=Post Traumatic Stress Disorder, Meds=Psychotropic Medication

White Youths

Results for the white group are presented visually in Figure 3. The number of types of maltreatment was significantly positively associated with mental health problems but the relationship between family history and mental health problems was not statistically significant. These variables did not have a direct effect on medication use but as proposed were directly associated with mental health problems. Mental health problems were significantly associated with receipt of residential treatment, psychiatric hospitalization and medication use. The direct relationship between mental health problems and medication use was strongest.

The hypothesis that facilitating situations would partially mediate the relationship between mental health problems and medication treatment was not supported for white youths. None of the facilitating situations was found to mediate this relationship. Outpatient therapy was significantly associated with medication use, but this effect was independent of the variance explained by mental health problems. Psychiatric hospitalization was found to have no direct relationship with medication use. Psychiatric hospitalization and residential treatment were significantly positively associated with each other while residential treatment and outpatient therapy were significantly negatively associated.

Figure 3: Structural Model for White Youths



Youths of Color

Results for youths of color are presented visually in Figure 4. The relationships between mental health problems and maltreatment and mental health problems and family history were both significant. Mental health problems were significantly associated with receipt of hospitalization, residential treatment, and outpatient therapy. The standardized coefficient directly to medication from mental health problems was significant and similar in magnitude to that in the white group. In the youths of color group, however, this relationship was not as strong as that between mental health problems and hospitalization.

Psychiatric hospitalization was found to mediate the relationship between mental health problems and medication use among youths of color when tested using the indirect effects command. With the more stringent bootstrapping method used, the result no longer reached statistical significance ($p=.11$). Residential treatment and outpatient therapy were not significantly associated with psychotropic medication treatment either directly or indirectly. None of the associations between the facilitating mental health services were significant.

Several covariates were significant among youths of color and remained in the model. Male youths of color were both less likely to have a mental health problem and more likely to be on psychiatric medications. Living in St. Louis City was also negatively associated with having a mental health problem and with getting outpatient therapy but was positively associated with psychiatric hospitalization.

Figure 4: Structural Model for Youths of Color

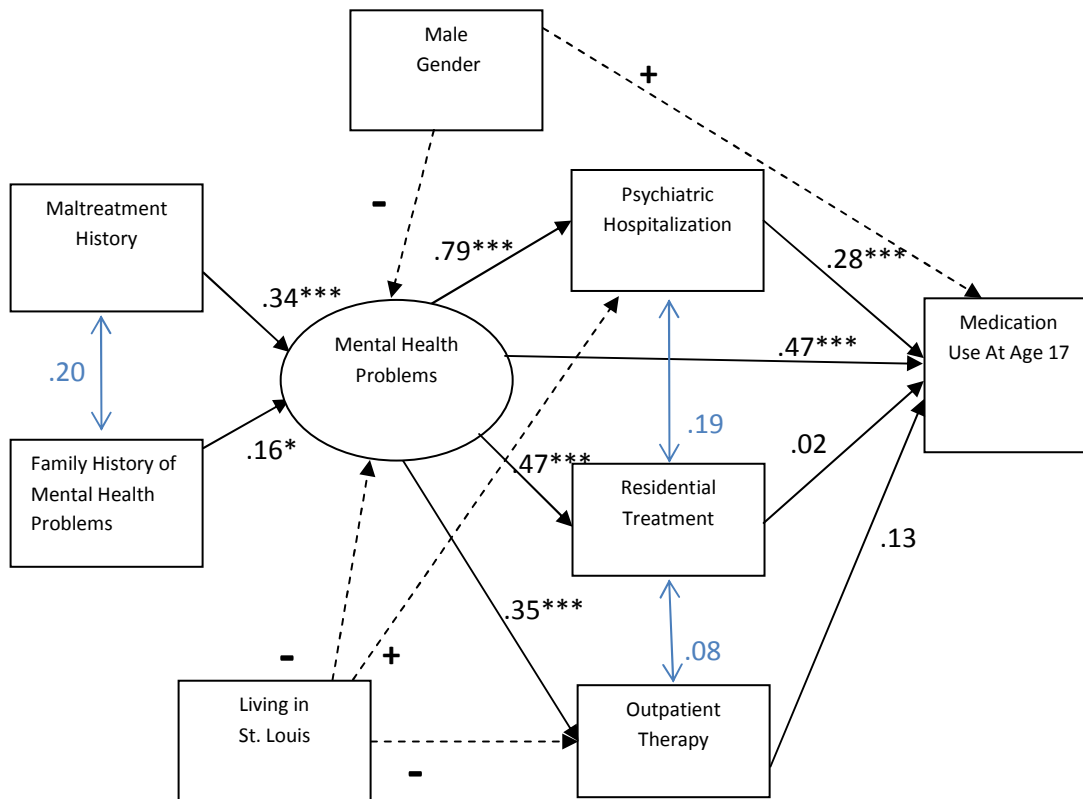
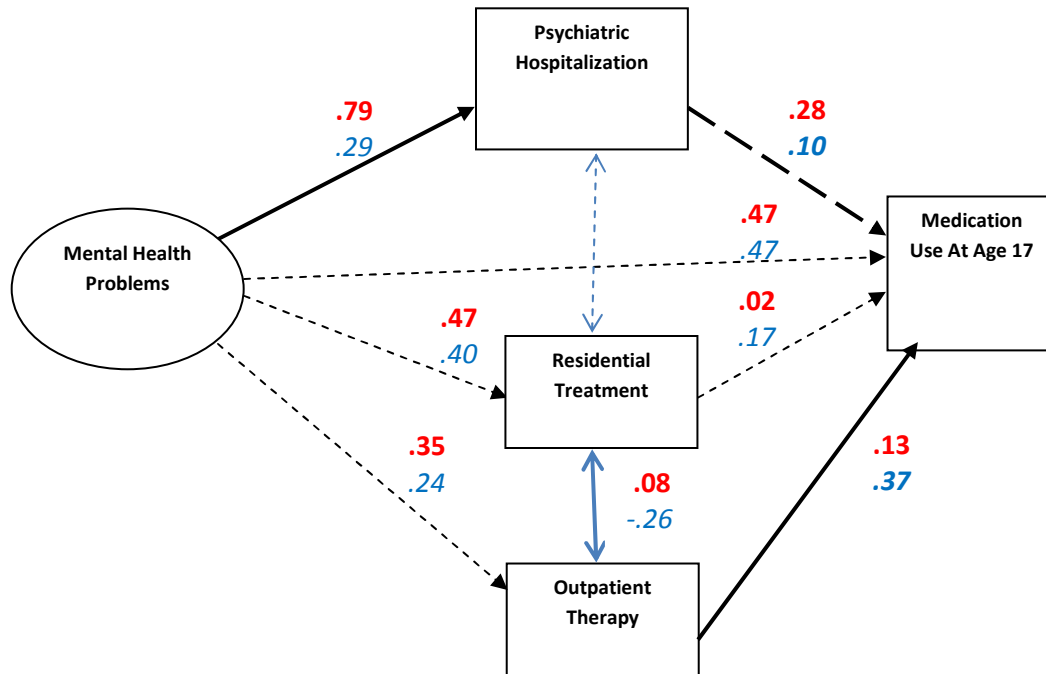


Figure 5: Racial Group Differences in Paths to Medication

Red/Bold=Youths of Color

Blue/Italics=White Youths

Significant differences are indicated with solid bold lines



Group Differences

Difference testing identified paths that were significantly different between the two racial groups. Comparisons of coefficients between the two groups are presented in Figure 5 with significant relationships indicated with bold, solid lines. There was no difference in the strength of the direct relationship between mental health problems and medication use. The coefficients between mental health problems and medication use were the same in each group; 0.47 for youths of color and for white youths. Some differences were significant in the relationships between mental health problems and other types of treatment. The relationship between mental

health problems and hospitalization was significantly stronger among youths of color than among white youths. The differences in the paths to residential treatment and to therapy were not significantly different by race, though coefficients were higher for youths of color.

There were also some differences in the relationships between other types of mental health treatment and medication use. The relationship between therapy and medication use was significantly stronger in the white group. The path from psychiatric hospitalization to medication use was higher among youths of color and the difference neared statistical significance ($p=.09$). The difference in the groups on the association between residential treatment and outpatient therapy was also significant. While there was a significant negative relationship between the two settings for white youths, there was no relationship at all among youths of color.

Summary of Aim 1 Results

The proposed model of paths to medication use generally fit the data well with the exception of attitudes toward medications which was eliminated from the final model. The hypothesis that white youths and youths of color would have significantly different relationships between mental health need and treatment was partially supported. Youths of color had a significantly higher path coefficient between mental health problems and psychiatric hospitalization/emergency room use than white youths. Paths between mental health problems and other types of mental health treatment were not significantly different. There was no difference in the relationship between mental health problems and medication use between the two racial groups.

Hypotheses related to the role of facilitating situations and mental health treatment were not supported. None of the facilitating mental health situations significantly mediated the relationship between mental health problems and medications. For white youths, therapy was independently associated with medication use but this relationship was not present for youths of

color. Residential treatment was not significantly associated with medication use either directly or indirectly for either racial group.

Results of Aim 2: Medication Use Between Ages 17-18

Aim 2: *To examine patterns and circumstances of continuity and change in psychotropic medication use over one year in a cohort of older foster youths and investigate how these patterns vary by race*

Aim 2 analyses moved to an examination of medication use patterns over the subsequent year for youths who stayed in state custody (n=294, sample characteristics Table 2).

Overall Rates

Almost thirty five percent of this sample were on a medication at the first interview (34.7%, n=102). An additional 7.5% (n=22) started a psychotropic medication at some point during the year. Overall, 42.2% of the sample used a medication at some time during the year (n=124, Table 5). Of those who used medications, anti-depressants were most common (78.2%, n=97), followed by anti-psychotics (54.8%, n=68), mood stabilizers (39.5%, n=49), and stimulants (22.6%, n=28).

Table 5: Rates of Medication Use Overall and By Class, Divided by Race

	Rates across 12 months %,(n=294)	% among those on a medication %,(n=124)	Average # of months on medication, sd For those who took each type
All Medications			
Overall	42.2(124)	100.0 (124)	9.2 (3.6)
White	54.4 (62)	50.0 (62)	10.0 (3.2)
Youths of Color	34.4 (62) ***	50.0 (62)	8.4* (3.8)
Antidepressant			
Overall	33.0 (97)	78.2 (97)	8.5 (3.7)
White	44.7 (51)	82.3 (51)	8.8 (3.7)
Youths of Color	25.6 (46)***	74.1 (46)	8.2 (3.8)
Antipsychotic			
Overall	23.1 (68)	54.8 (68)	8.8 (3.7)
White	29.0 (33)	53.2 (33)	9.5 (3.5)
Youths of Color	19.4 (35)	56.5 (35)	8.1 (3.7)
Mood Stabilizer			
Overall	16.7 (49)	39.5 (49)	8.5 (3.8)
White	23.7 (27)	43.6 (27)	9.1 (3.7)
Youths of Color	12.2* (22)	35.5 (22)	7.8 (3.9)
Stimulant/ADHD			
Overall	9.5 (28)	22.6 (28)	8.8 (4.2)
White	15.8 (18)	29.0 (18)	10.5 (2.4)
Youths of Color	5.6 (10)**	16.1 (10)	6.2* (5.1)
Antianxiety			
Overall	3.7 (11)	8.9 (11)	6.6 (4.8)
White	4.4 (5)	8.1 (5)	6.2 (5.5)
Youths of Color	3.3 (6)	9.9 (6)	7.0 (4.5)
Antihypertensive			
Overall	2.4 (7)	5.7 (7)	8.4 (4.2)
White	3.5 (4)	6.5 (4)	8.7 (4.6)
Youths of Color	1.7 (3)	4.8 (3)	8.0 (4.6)

* $p<0.05$, ** $p<.01$, *** $p<.001$

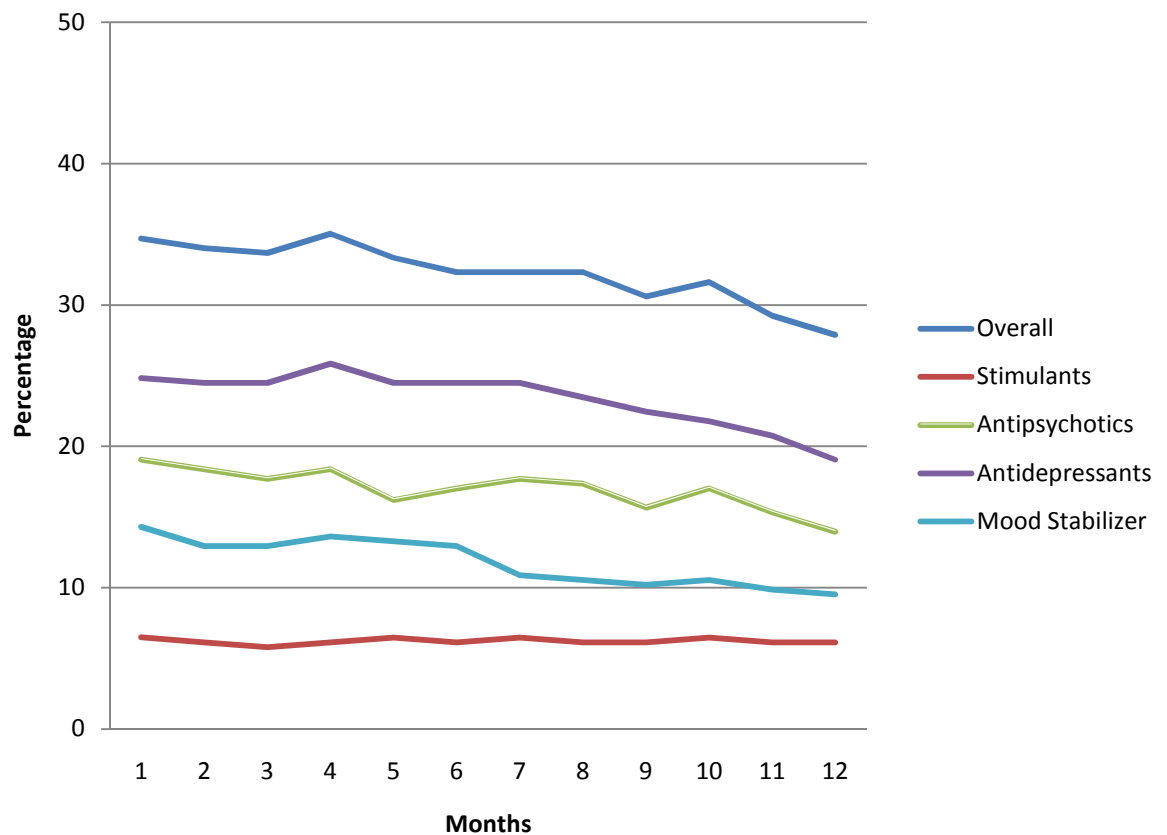
Polypharmacy

Among youths taking medications, the average number taken at age 17 was 2.25 (n=102). Just over one third of those on medications took one medication (n=35, 34.3%), another third took 2 medications (n=31, 30.4%), 17.7% (n=18) took 3 medications and 17.7% (n=18) took 4 or more. These percentages did not change significantly over the course of the study. In month 12, fewer youths took medications (n=82) but the distribution was similar. The average number of medications taken was 2.21 with 34.2% taking 1 medication, 36.6% taking 2, 13.4% taking 3, and 15.9% taking 4 or more. Antidepressants and antipsychotics were the most commonly prescribed combination with 47.8% of those who were taking two or more medications prescribed both an antipsychotic and an antidepressant. Within class polypharmacy was relatively rare. Of the youths who were taking two or more medications at the start of the study (n=67), 20% (n=13) were taking two antidepressants, 3% (n=2) were taking two antipsychotics, and 9% (n=6) were taking two mood stabilizers. One youth was taking three mood stabilizers.

Rates Across the Year

Overall rates each month began at 34.7% and declined to 27.9% in the final month of the year (see Figure 6). Gradual declines were observed in all types of medications with the exception of stimulants where use remained constant.

Figure 6: Rates of Medication Use Between Ages 17-18



Length of medication treatment

Overall, 22.1% (n=65) of the sample was on at least one medication for the entire 12 months. That is 52.4% of those who took a medication and 63.7% of those who started the study on medications. The average amount of time on a medication was 9.2 months for the overall sample of youths who took medications (n=124) and 9.9 for those who started the study on medications (n=102). No significant differences in the average number of months by medication type were observed (Table 6).

Length of treatment was examined in detail for youths who started the study on medications and thus had the potential to be on a medication for 12 months. Details by medication class and specific medication are presented in Table 6 for each medication with a sample size of n=10 or greater. Stimulants were the most stable medication type with 54.2% of those who started on a stimulant taking the medication for 12 months. Dextroamphetamine (Adderall) was the most stable individual medication (57.1% taking for 12 months) followed by risperidone (Risperdal) (50.0% taking for 12 months). While 44.1% of individuals taking an antidepressant took an antidepressant for the entire study period, the rates of stability for individual medications were lower with the highest being bupropion (Wellbutrin) (38.1% taking for 12 months) and venlafaxine (Effexor) (37.5% taking for 12 months).

Table 6: Rates of Specific Types of Medication Use and Length of Use For Youths Who Started the Study on a Medication

	% on medication (n=102)	% of those on a given medication who stayed on it for all 12 months (n)	% of those on a given medication who stayed on med for 6 months or less (n)
Stimulants	23.5 (24)	54.2 (13/24)	29.2 (7/24)
Dextroamphetamine (Adderall)	13.7 (14)	57.1 (8/14)	21.5 (3/14)
Antidepressants	82.4 (84)	44.1 (37/84)	26.2(22/84)
Citalopram (Celexa)	13.7 (14)	21.4 (3/14)	50.0 (7/14)
Venlafaxine (Effexor)	15.7 (16)	37.5 (6/16)	37.5 (6/16)
Paroxetine (Paxil)	15.7 (16)	25.0 (4/16)	50.0 (8/16)
Fluoxetine (Prozac)	10.8 (11)	27.3 (3/11)	54.5 (6/11)
Trazodone (Desyrel)	13.7 (14)	21.4 (3/14)	64.3 (9/14)
Bupropion (Wellbutrin)	20.6 (21)	38.1 (8/21)	38.1 (8/21)
Sertraline (Zoloft)	21.6 (22)	22.7 (5/22)	45.5 (10/22)
Mood Stabilizer/Anti-manic	43.1 (44)	45.5 (20/44)	27.3 (12/44)
Valproic Acid (Depakote)	18.6 (19)	42.1 (8/19)	52.6 (10/19)
Oxcarbazepine (Trileptal)	10.2 (10)	20.0 (2/10)	20.0 (2/10)
Topiramate (Topomax)	17.7 (18)	16.7 (3/18)	44.4 (8/18)
Antipsychotic	60.8 (62)	48.4 (30/62)	25.8 (16/62)
Risperidone (Risperdal)	23.5 (24)	50.0 (12/24)	37.5 (9/24)
Quetiapine (Seroquel)	23.5 (24)	29.2 (7/24)	29.2 (7/24)
Olanzapine (Zyprexa)	19.6 (20)	35.0 (7/20)	45.0 (9/20)

Medication changes

The total number of medication changes across the time period ranged from 0-19. Details on medication changes are presented in Table 7. Only 16.1% of those on medications had no changes at all while 13.7% had 6 or more changes. The number of months where a change occurred was also calculated. Of those taking medications, 36% had changes in 1 month, 27% had changes in 2 months, 12% had changes in 3 months, 8% had changes in 4 months, and 1 youth had changes in 6 of the months. A change could be either an initiation or a discontinuation. There were a total of 312 changes across the sample – 181 discontinuations (58.0%) and 131 additions (42.0%). Of those who experienced a change (n=101), 13.9% started a medication but did not have any stops (n=14), 32.7% stopped a medication but did not have any starts (n=33), and 46.5% both stopped and started medications during the study period (n=54). Of those who took medications, 33.9% had discontinued completely by the end of the study (n=42).

Youths were assigned to four different categories based on their patterns of change (Table 7). The majority of youths were classified as continuous users or those who used medications in all 12 months (52.4%). Initiators were youths who started medications over the course of the study year (17.7%). Just over a quarter of the sample were discontinuers or those who started on a medication but discontinued all medications prior to the end of the study (26.6%). Intermittent use where youths had a break in their medication use but were using at both the start and end of the study was rare (3.2%).

Table 7: Medication changes, overall and by racial group

	Overall (n=124), %	White (n=62), %	Youths of Color (n=62), %
Total Changes			
0	23 (18.6)	14 (22.6)	9 (14.5)
1	31 (25.0)	15 (24.2)	16 (25.8)
2	25 (20.2)	10 (16.1)	15 (24.2)
3	14 (11.3)	9 (14.5)	5 (8.1)
4-5	14 (11.3)	6 (9.7)	8 (12.9)
6+	17 (13.7)	8 (12.9)	9 (14.5)
Total Additions			
0	56 (45.2)	27 (43.6)	29 (46.8)
1	33 (26.6)	18 (29.0)	15 (24.2)
2	20 (16.1)	9 (14.5)	11 (17.7)
3	8 (6.5)	4 (6.5)	4 (6.5)
4+	7 (5.6)	4 (6.5)	3 (4.8)
Total Discontinuations			
0	37 (29.8)	22 (35.5)	15 (24.2)
1	38 (30.7)	18 (29.0)	20 (32.3)
2	25 (20.2)	12 (19.4)	13 (21.0)
3	11 (8.9)	5 (8.1)	6 (9.7)
4+	13 (10.5)	5 (8.1)	8 (12.9)
Total Months with a Change			
0	21 (16.9)	14 (22.6)	7 (11.3)
1	40 (32.3)	18 (29.0)	22 (35.5)
2	30 (24.2)	11 (17.7)	19 (30.7)
3	13 (10.5)	8 (12.9)	5 (8.1)
4+	20 (16.1)	11 (17.7)	9 (14.4)
Discontinuers ¹	33 (26.6)	11 (17.7)	22 (35.5)*
Continuous ²	65 (52.4)	40 (64.5)	25 (40.3)**
Initiators ³	22 (17.7)	9 (14.5)	13 (21.0)
Intermittent ⁴	4 (3.2)	2 (3.2)	2 (3.2)

* $p < .05$, ** $p < .01$, *** $p < .001$

¹ Those who were on a medication at age 17 but discontinued prior to age 18

² Those who used a medication in all 12 months of the study

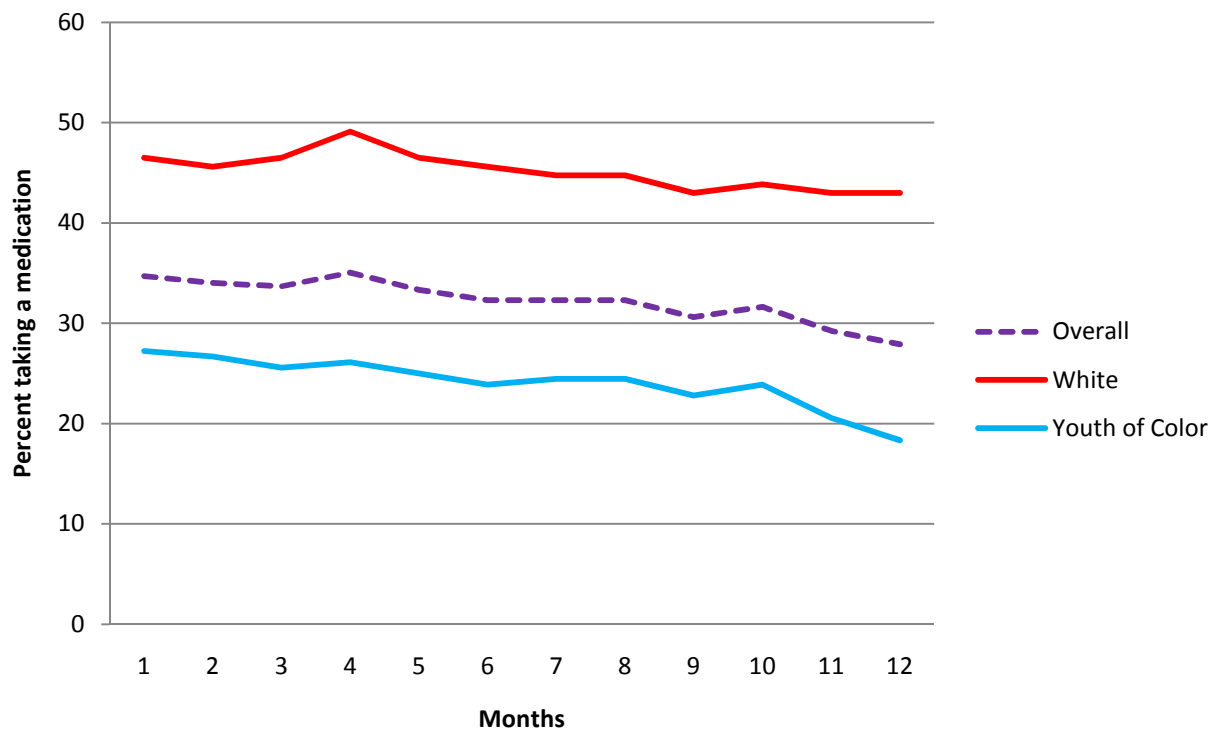
³ Those who were not on a medication at age 17 but started during the study year

⁴ Those who both stopped and started medications during the study year

Racial differences

Youths of color were significantly less likely to take a medication at any point over the study year. Over the study year, 54.4% of white youths took medications compared to 34.4% of youths of color (Table 5). The rates of use for youths of color declined over the study period with the sharpest declines in the last 2 months of the study. Rates for white youths declined only slightly. At the start of the study, 27.2% of youths of color were taking a medication but only 18.3% were taking a medication by the end of the study. For white youths, 46.5% of youths were taking a medication at the start of the study and 43.0% were taking a medication at the end of the study year.

Figure 7: Overall Rates of Psychiatric Medication Use by Race



For those who took medications, there were no significant differences in the types of medications taken by race (see Table 5). Youths of color took medications for significantly less time, however. White youths took medications for an average of 10.0 months compared to 8.4 months for youths of color ($t=2.47$, $df=122$, $p=.01$). The average number of months was smaller in all drug classes for youths of color, though significant differences were only observed in the stimulant category where youths of color took medications for an average of 6.2 months compared to 10.5 months for white youths ($t=2.48$, $df=11.7$, $p=.03$).

The number of medication changes did not differ significantly by race, though white youths had higher percentages of no change and of no discontinuations (Table 7). Youths of color were significantly more likely than white youths to be classified as discontinuers compared to continuous users ($OR=3.2$, $CI: 1.32-7.71$, $p=.01$).

Medication changes

A negative binomial regression model was constructed to examine covariates related to the count of medication changes for those who were on a medication during the study period (n=124). Results are presented in Table 8. Male youths had significantly lower incidence rate ratios meaning the incidence of medication changes over the year was significantly lower in males than females. Having a higher numbers of school problems, involvement in the criminal justice system, and being in residential care in the past year were associated with higher incidence of medication changes over the study year.

Table 8: Negative Binomial Regression of Count of Medication Changes for youths who were on a medication between age 17-18 (n=124)

	Incident Rate Ratio, CI
Youths of color	1.03 (.73, 1.45)
Male	.56 (.40, .78)***
St Louis City	1.31(.90, 1.90)
Mental Health Problems Factor Score	.83 (.62, 1.11)
School Problems Scale	1.13 (1.01, 1.27)*
Criminal Justice Involved	1.59 (1.15, 2.18)**
Any Maltreatment	1.00 (.69, 1.47)
Family History of Mental Health Problems	.91 (.66, 1.27)
Medication Helps	1.12 (.96, 1.30)
Past Year Outpatient Therapy	1.07 (.77, 1.48)
Past Year Residential Care	1.44 (1.01 2.06)*
Past Year Psychiatric Hospital/ Emergency Room	1.22 (.88, 1.68)
Likelihood Ratio $X^2=38.58$, $p=.001$, Nagelkerke $R^2=.27$	
* $p<.05$, ** $p<.01$, *** $p<.001$	

Reasons for stopping

When youths reported discontinuing a medication (n=87), they were asked the reason for the change and whose decision it was to stop the medication. The most common reasons for discontinuation reported by the youths were that they no longer needed the medication (34.4%, n=30), side effects (22.9%, n=20), and the medication was not working (n=19). The majority of youths reported the decision to stop a medication was made by a mental health professional (58.6%, n=51), though almost a third of youths reported making the decision to stop a medication on their own (31.0%, n=27).

Reasons for medication discontinuations were also examined by race. Of the 87 youths who had a medication discontinuation, 40 were white (46.0%) and 47 were youths of color (54.0%). Youths of color were significantly more likely to report problems related to access to medications as a barrier than white youths ($\chi^2=5.76$, $df=1$, $p=.02$). A higher percentage of white youths also reported that the decision to stop medications was made by a mental health professional (65.0%, n=26) compared to youths of color (53.2%, n=25) and a higher percentage of youths of color reported making the decision to stop a medication themselves (36.2%, n=17) compared to white youths (25.0%, n=10) though these differences were not statistically significant.

Summary of Aim 2 Results

This aim provided a descriptive overview of the medication use patterns between ages 17 and 18 for youths who were in state custody. Over forty percent of youths took a medication at some point over the study year. Overall rates of medication in the study population declined gradually from 34.7% at age 17 to 27.9% at age 18. Antidepressants were the most prevalent medication used, followed by antipsychotics and mood stabilizers. Stimulants were used less frequently but had the most stable patterns of use. Medication changes were common across the study year, with 18.9% of youth having no changes at all. Most commonly youth had 1-2 changes (45%). There were no racial differences in the types of medications used, however, youths of color who were on medications at age 17 were more likely to discontinue medication by age 18 than white youths. Youths of color were also significantly more likely to report they discontinued a medication due to problems with access. Among youths who used medications, those with more school problems, criminal justice involvement or a history of residential treatment and those who were female had higher numbers of medication changes.

Results of Aim 3: Medication Use Subgroups

Aim 3: To identify and characterize subgroups of youths with similar medication utilization patterns specifically accounting for race and explore the association of group membership with later outcomes.

3A. A latent growth model was used to identify classes of youths with different medication use patterns, including living situation as covariates

Hypothesis 3A: Among the patterns that emerge, it is likely that the following groups will emerge: 1) A group that was not using medications and remained off medications throughout the study period. 2) A group who started on medications but discontinued use 3) A group whose medication regimens were stable throughout the study period and 4) A group whose medication use was characterized by instability with multiple changes in medications

3B. To further understand subgroup composition, post hoc analyses examined characteristics associated with subgroup membership including race, gender, family mental health history, diagnoses, symptoms, functional indicators, maltreatment history, and the number of placement changes.

Hypothesis 3B: Youths who are in the high changing category will also be youth with the highest need and highest number of placement changes. Youth who discontinue are expected to exhibit lower levels of need.

3C. Analyses examined whether these subgroups were associated with mental health and functional outcomes and with attitudes toward mental health services at age 19.

H3C: Youths whose regimens are characterized by instability will have worse functional outcomes, higher ongoing mental health need and more negative attitudes toward mental health services than the other groups.

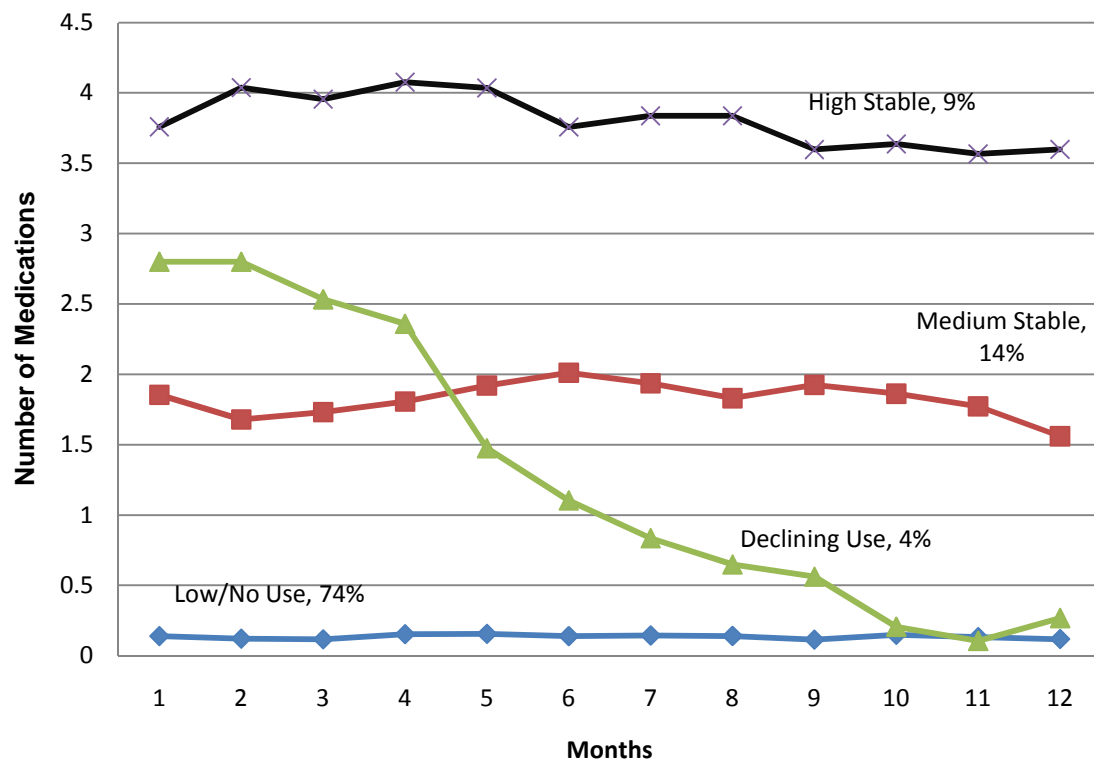
Latent Medication Use Classes

Latent medication use groups were identified using procedures as described in the methods section. The dependent variable was the number of medications measured at each month between ages 17 and 18. The best fitting model identified four latent classes as the best solution. This model had the lowest AIC (4226.40) and SBIC (4241.65) values and the highest Entropy (.965) and identified four conceptually meaningful groups - a low/no use group (n=217), a medium use group (n=41), a declining use group (n=11), and a high use group (n=24).

Assignment of Classes

A probability of being assigned to each class was generated by MPlus for each subject. Across the sample, the certainty of assignment to each class was high. For those in latent class 1 (low/no use), the overall probability for most likely membership in that class was .990. For those in class 2 (medium use), it was .905, for those in class 3 (declining use), it was .995, and for those in class 4 (high use), it was .978. Given these high levels of certainty in class assignment, the decision was made to assign individuals to a class for the rest of the analyses without any weighting.

Figure 8: Latent Medication Use Groups



The largest group was composed of individuals who had either never used or had used just one medication over the course of the study (74%). Within this group, 78% had never used a

medication at all and 22% had low use. The next largest group was composed of individuals with relatively stable use averaging between 1-2 medications over the year (14%). The third class contained a small number of youths who started out on several medications but discontinued use over the year (4%). A final group of youths (9%) were characterized by a consistently high number of medications across the study year.

Aim 3B: Covariates Associated with Class Membership

Medication Characteristics

Medication use groups were examined descriptively by medication types and the number of changes. Youths in all three medication use groups took antidepressants at very high rates. Youths in the declining use and high use groups were most likely to be taking an antipsychotic. Even though youths in the medium and high use groups had relatively stable medication counts over time, both groups experienced medication changes. Youths in the medium use group had a mean of 2.2 changes and youths in the high use group had a mean of 3.6 changes. Youths in the declining use group had the highest mean number of changes. The most commonly used drugs in the low/no use and medium/stable use groups were antidepressants while in the declining use and high stable use groups, antipsychotics were most common.

Table 9: Medication Use for Each Medication Use Subgroup

	Group 1: No/Low Use n=214, (%)	Group 2: Medium Stable Use n=41, (%)	Group 3: Declining Use n=11, (%)	Group 4: High Stable Users n=25, (%)
Anti-psychotic	12 (5.5)	24 (58.5)	9 (81.82)	23 (92.0)
Anti-depressant	32 (14.8)	35 (85.4)	8 (72.7)	22 (88.0)
Mood Stabilizer	7 (3.2)	16 (39.0)	7 (63.6)	9 (76.0)
Stimulant	2 (.92)	8 (19.5)	2 (18.2)	13 (52.0)
Anti-anxiety	2 (0.9)	2 (4.9)	1 (9.1)	6 (24.0)
Anti-hypertensive	1 (0.5)	2 (4.9)	1 (9.1)	3 (12.0)
Mean Number of Changes	.4 (.07)	2.2 (.36)	4.2 (.72)	3.6 (.77)

Bivariate Relationships

Each covariate was examined bivariately with class membership. Results are presented in Table 10. Youths of color were more likely to be in the low use and declining use groups while white youths were more likely to be in the medium and high use classes. Youths living in kinship placements and in foster homes were more likely to be in the low use group while the other three groups were characterized by high rates of congregate care. Youths in all three medication using groups displayed high rates of lifetime mental disorders compared to the low use group. All three medication using groups also displayed high levels of past year depression, while youths in the declining and high use groups had higher rates of past year disruptive behavioral disorders than youths in the medium use group. All three medication use groups had high rates of other types of mental health treatment in the past year compared to their low use group peers. Youths in the declining use group had the highest rates of past year psychiatric hospitalization and residential care as well as high rates of outpatient therapy. This group also had the highest count of maltreatment.

Table 10: Bivariate Descriptives for Each Medication Subgroup

	Group 1 Low/No Use	Group 2 Medium Stable	Group3 Declining Use ¹	Group4 High Stable	Significant differences
	n=217 (%)	n=41 (%)	n=11 (%)	n=25 (%)	
Race					
Youths of Color	146 (67.3)	17 (41.5)	7 (63.6)	10 (40.0)	2-1 **, 4-1 *
Gender					
Male	94 (43.3)	18 (43.9)	4 (36.4)	11 (44.0)	n.s.
Living Situation at 17					
Independent	10 (4.8)	0	0	3 (12.0)	n.s.
Parent/ Relative	52 (24.8)	3 (7.3)	1 (9.1)	0	1-2*, 1-4**
Foster home	73 (34.8)	9 (22.0)	0	6 (24.0)	1-3*.
Congregate care	75 (35.7)	29 (70.7)	10 (90.9)	16 (64.0)	1-2***, 1-3***, 1-4***
Average restrictiveness over 12 months	2.9	3.9	4.0	3.7	
Average # months with placement change	1.3	1.2	2.9	1.1	
Geographic Region					
St. Louis City	99 (44.7)	11 (26.8)	4 (36.4)	7 (28.0)	1-2*
St. Louis County	66 (30.4)	12 (29.3)	5 (45.5)	6 (24.0)	
Southwest Missouri	34 (15.7)	13 (31.7)	2 (18.2)	3 (12.0)	n.s.

Outlying Counties	20 (9.2)	5 (12.2)	0	9 (36.0)	1-4***, 2-4*
Current Mental Disorders					
Depressive	24 (11.1)	15 (36.6)	5 (45.5)	9 (36.0)	1-2***, 1-3*, 1-4**
Bipolar I	4 (1.9)	4 (9.8)	3 (27.3)	4 (16.0)	1-2*, 1-3***, 1-4**
PTSD	8 (3.7)	7 (17.1)	3 (27.3)	5 (20.0)	1-2**, 1-3**, 1-4**
ADHD	17 (7.9)	7 (17.1)	3 (27.3)	6 (24.0)	1-3*, 1-4*
Disruptive Behavioral	24 (11.1)	5 (12.2)	5 (45.5)	9 (36.0)	1-3**, 1-4**, 2-3*, 2-4*
Lifetime Mental Disorders					
Depressive	41 (19.0)	21 (51.2)	6 (54.6)	11 (44.0)	1-2***, 1-3*, 1-4**
Bipolar I	6 (2.8)	4 (9.8)	3 (27.3)	5 (20.0)	1-2*, 1-3**, 1-4**
PTSD	22 (10.2)	9 (22.0)	4 (36.4)	10 (40.0)	1-2*, 1-3*, 1-4***
ADHD	27 (12.5)	11 (26.8)	7 (63.6)	14 (56.0)	1-2*, 1-3***, 1-4***, 2-3*, 2-4*
Disruptive Behavior	86 (39.8)	21 (51.2)	9 (81.8)	14 (56.0)	1-3*
Symptom/Functional Indicators					
Affect Dysregulation Scale Mean	20.16	26.46	27.54	29.61	1-2***, 1-3**, 1-4***
Depression Scale Mean	13.92	27.88	33.55	29.64	1-2***, 1-3***, 1-4***

School Problem Count	1.75	1.32	2.36	2.24	1-2*, 1-4*, 2-3*, 2-4**
Criminal Justice Involved	78 (35.9)	22 (53.7)	5 (45.5)	13 (52.0)	1-2*
Maltreatment					
Physical Abuse	88 (40.6)	24 (58.5)	10 (90.9)	18 (72.0)	1-2*, 1-3*, 1-4**
Sexual Abuse	62 (28.6)	18 (43.9)	7 (63.6)	15 (60.0)	1-3*, 1-4**
Physical Neglect	98 (45.2)	24 (58.5)	8 (72.7)	11 (44.0)	
# Types of Maltreatment					
0	68 (31.3)	9 (22.0)	1 (9.1)	3 (12.0)	n.s.
1	74 (34.1)	10 (24.4)	1 (9.1)	8 (32.0)	n.s.
2	51 (23.5)	10 (24.4)	3 (27.3)	6 (24.0)	n.s.
3	24 (11.1)	12 (29.3)	6 (54.6)	8 (32.0)	1-2**, 1-3***, 1-4**
Family History	103 (47.5)	25 (61.0)	5 (45.5)	17 (68.0)	n.s.
Attitude toward Mental Health Services					
Overall Scale Mean	2.37	2.46	2.40	2.48	n.s.
Medications help	102 (47.0)	23 (56.1)	8 (72.7)	19 (76.0)	1-4**
Past year - Mental Health Treatment					
Psychiatric hospital/ Emergency Room	21 (9.7)	11 (26.8)	8 (72.7)	12 (48.0)	1-2**, 1-3***, 1-4***, 2-3**

Residential treatment	85 (39.2)	26 (63.4)	9 (81.8)	16 (64.0)	1-2**, 1-3*, 1-4*
Outpatient therapy	97 (44.7)	28 (68.3)	8 (72.7)	18 (72.0)	1-2**, 1-4*

*p<.05, **p<.01, ***p<.001

¹ very small sample size leads to potential issues with quasi-separation in regression models, results should be interpreted with this in mind

Multivariable Relationships

A multivariable multinomial logistic regression model was fit to assess variables associated with class membership while controlling for all other variables in the model. Results of each class compared against the low/no use class are presented in Table 11. Compared to those who took little or no medications over the year, the medium use group were less likely to be youths of color and more likely to have a history of a mood disorder. They had significantly higher scores on both the depression and affect dysregulation scales. Youths in the declining use group had significantly higher depression scale scores than youths in the low/no use groups. Youths in the highest use group were also less likely to be youths of color and were more likely to have a history of an ADHD diagnosis but less likely to have a lifetime history of disruptive behavior disorder. The highest users also had significantly higher scores on the affect dysregulation scale than those in the no use group.

Comparisons between each of the medication use groups were also performed simultaneously in this analysis (results not reported in a table). Compared to the medium use group, youths in the high use group were significantly more likely to have ADHD (OR=4.6, CI:1.1-19.2, $p=.04$). Youths in the medium use group also had significantly lower relative risk of school problems compared to youths in the high use (OR=.44, CI:.25-.76, $p=.003$) and the declining use group (OR=.45, CI:.24-.87, $p=.02$). Youths in the declining use group had significantly higher rates of past year psychiatric hospitalization than youths in the medium use group (OR=8.4, CI:1.3-55.4, $p=.03$). Youths in the high medication use group were more likely to say that medications were helpful compared to those in the medium use group (OR=4.8, CI:1.2-19.3, $p=.03$). There were no significant differences between youths in the declining use group and youths in the high use group.

**Table 11: Multinomial Logistic Regression Model
Odds Ratios, CIs (n=294)**

	Medium use vs. No Use	Declining vs. No use ¹	High use vs. No use
Youths of Color	0.2 (0.1,0.6)**	0.6 (0.1,4.1)	0.2 (0.05,0.8)*
Male	3.5 (1.4,9.0)**	3.6 (0.5,25.1)	3.9 (1.2,12.9)*
Geographic Region			
St. Louis City	0.8 (0.3,2.3)	0.7 (0.1,4.4)	1.2 (0.3,4.7)
Lifetime Disorders			
Mood Disorder	3.1 (1.2,8.1)*	1.2 (0.2,7.0)	2.7 (0.8,9.2)
ADHD	0.8 (0.3,2.5)	3.1 (0.5,17.9)	3.7 (1.0,13.1)*
Disruptive Behavior	0.7 (0.3,1.7)	1.3 (0.2,8.8)	0.3 (0.1,0.9)*
Symptom/Functional Indictors			
Affect Dysregulation Scale	1.1 (1.0,1.1)*	1.0 (0.9,1.2)	1.1 (1.0,1.2)**
Depression Scale	2.5 (1.1,5.6)*	2.2 (0.4,13.7)	1.5 (0.5,4.7)
School Problems	0.5 (0.3,0.7)***	1.0 (0.6,1.8)	1.0 (0.7,1.6)
Criminal Justice Involved	1.6 (0.7,3.9)	0.7 (0.1,3.8)	0.8 (0.3,2.6)
Any Maltreatment	0.7 (0.3,2.0)	0.2 (0.02,2.6)	0.4 (0.1,2.1)

Family History	1.1 (0.4,2.7)	0.2 (0.04,1.3)	1.0 (0.3,3.2)
Attitude Toward Medication	1.1 (0.5,2.8)	5.5 (0.9,34.1)	5.5 (1.5,20.3)
Outpatient Therapy	1.9 (0.8,4.7)	3.2 (0.6,18.0)	2.4 (0.7,7.8)
Psychiatric Hospitalization/Emergency Room	2.8 (1.0,8.1)	23.9 (3.9,145.9)**	5.9 (1.7,20.2)**
Residential Care	3.3 (1.3,8.6)*	8.8 (1.1,69.4)*	3.6 (1.1,11.9)*

Model Fit: Likelihood Ratio $\chi^2=168.11$, $df=48$, $p<.00001$, Nagelkerke $R^2=.54$

* $p<.05$, ** $p<.01$, *** $p<.001$

¹ This group has a small number of members ($n=11$), leading to wide confidence intervals and potentially unstable estimates, especially when there is little variation among the group related to the outcome (quasi-separation)

Relationship to Outcomes

Bivariate comparisons

The association between medication use class membership and outcomes at age 19 was examined using logistic regression for categorical outcomes and ordinary least squares regression for continuous outcomes. The overall sample for examining outcomes was reduced due to missing final interviews for 34 youths (11.6%). These youths disproportionately came from the declining use group (4/11, 36.4%), further reducing the power to detect differences for this group. Youths in the low/no use group, medium use group and high use groups retained between 90-95% of their original samples at the final interview. The final group sizes for examining outcomes were: low/no use group (n=194), medium stable use (n=39), declining use (n=7), and high stable use (n=22).

Medication class membership was associated with some outcomes at age 19. Youths in the medium use group were less likely to have left state custody and had more positive attitudes toward mental health services overall. This group was most likely to be working or in school. Youths in the declining use group were most likely to have left care and to be disengaged from work and school. None of these youths endorsed symptoms fitting criteria for the assessed mental disorders. Over half of the youths in the high stable group and 42% of those in the medium use groups were still using a medication at age 19.

Table 12: Bivariate Relationships to Outcomes at Age 19

	Group 1 Low/No Use	Group 2 Medium Stable	Group 3 Declining Use	Group 4 High Stable	Significance Test ¹
	n=192	n=39	n=7	n=22	
Past year mental disorder					
Depression	12 (6.3)	7 (18.0)	0	5 (22.7)	1-2*, 1-4*
Bipolar I	3 (1.6)	5 (12.8)	0	3 (13.6)	1-2**, 1-4**
PTSD	8 (4.2)	2 (5.1)	0	3 (13.6)	n.s.
Anti-social personality	15 (7.8)	3 (7.7)	0	1 (4.6)	n.s.
Generalized anxiety	2 (1.0)	1 (2.6)	0	1 (4.6)	n.s.
Any diagnosis in past year	31 (16.2)	12 (30.8)	0	7 (31.8)	1-2*
Attitude					
Overall	2.3	2.6	2.2	2.2	1-2**, 2-4*
Medications helpful	2.20	2.80	2.45	2.48	1-2**
Depression scale mean	9.66	14.14	13.85	19.28	1-4**
Depression scale clinical cut off	29 (13.4)	8 (19.5)	2 (18.2)	7 (28.0)	
Currently taking medication	12 (6.3)	17 (43.6)	0	11 (50.0)	1-2***, 1-4***
Past year psychiatric hospitalization	8 (2.1)	4 (10.3)	0	2 (9.09)	1-2*
Currently working or in school	111(57.8)	29 (74.4)	1 (14.3)	11 (50.0)	2-3**
Had left child welfare custody	86 (44.8)	10 (25.6)	5 (71.4)	12 (54.6)	1-2*, 2-3**, 2-4*

*p<.05, **p<.01, ***p<.001

¹ Significance tests were conducted using exact multinomial logistic regression

Multivariable Regression

Multivariable regression models were created to further assess relationships that were found to be significant at the bivariate level and were of conceptual interest. A logistic regression model was fit to assess the impact of class membership on being engaged in school or work at age 19, controlling for race, gender, having left state custody, depression scale score, and any diagnosis. Classes were dummy coded and the medium use group was used as the reference category. This was chosen as the reference because youths in the medium use stable group were more likely to be working or in school than each of the other groups in bivariate analyses. Results are presented in Table 13. Youths in all of the other groups were less likely to be engaged in school or work than those in the medium use group, even after controlling for all the other variables in the model. The model was also run with each of the other groups designated as the comparison group (not shown in table). Youths in the declining use group were less likely to be productive than those in the no use group but the relationship was not statistically significant (OR=0.13, CI:0.0-1.2, p=.07). None of the other comparisons was significant.

A logistic regression was also fit for those above the clinical cut off on the depression scale, a measure of depressive symptoms experienced within the past four weeks. The medium use class was used as the comparison group as presented in Table 13. The model was also re-run using each of the medication use groups as the comparison group (not shown in table). When controlling for other variables, the relationship between depression and membership in the high medication use class remained significant. These youths were significantly more likely to be above the cut off depression score at age 19 than those in the medium use group (OR=4.4, CI:1.0-19.2, p=.04) and those in the no use group (OR=5.9, CI: 1.9-18.7, p=.003).

**Table 13: Multivariable Regression:
Engagement in School/Work & Depression at Age 19**

	Engaged in School or Work OR, CI	Current Depression OR, CI
Youths of color	1.2 (0.7, 2.2)	3.5 (1.3, 9.3)**
Male	1.3 (0.8, 2.3)	0.5 (0.2,1.2)
Left State Custody	0.3 (0.2, 0.6)***	1.1 (0.5, 2.7)
Past Year Mental Disorder Diagnosis	0.9 (0.4, 2.0)	5.5 (2.1,14.4)***
Med Use Class		
1	0.4 (0.1, 0.9)*	0.7 (0.2, 2.4)
2	1.0	1.0
3	0.05 (0.005, 0.5) *	2.6 (0.3, 27.3)
4	0.3 (0.08, 0.9)*	4.4 (1.0,19.2)*
Depression Scale Score	1.3 (0.6, 2.8)	—
Engaged in School or Work	-----	1.5 (0.6,3.6)

*p<.05, **p<.01, ***p<.001

Summary of Aim 3 Results

Four medication use subgroups were successfully identified through latent growth mixture modeling – a low/no use group, a medium stable use group, a declining use group, and a high stable use group. The dependent variable used was a count of medications rather than a count of medication changes. Medication use patterns when measured with the count variable were relatively stable with one small group displaying a pattern of declining use. A high changing group was not identified. Nevertheless, as hypothesized, no/low use, declining use, and stable use groups were identified.

The greatest differences between groups were observed between the low use group and all the other groups. The highest use group showed higher rates of ADHD compared to the medium use group. There were no significant differences identified between the declining and high stable use groups at age 17. Since a high changing group was not identified in these analyses, hypotheses related to this group were not tested. There was no evidence to support the hypothesis that those in the declining use group had less mental health need at age 17 though they did not endorse symptoms of mental disorders or report psychiatric hospitalization at age 19. The declining use group was most likely to leave state custody and many were lost to follow-up by the final interview. Those in the medium use group were significantly more likely to be engaged in school or work, even when controlling for other variables. Youths in the highest use group were more likely to be above the clinical cut off for depression than both the low/no use and medium use groups.

Chapter 5: Discussion

Psychotropic medication use is an area of increasing concern for the child welfare system as administrators move to develop and implement policies to ensure appropriate prescribing. For older youth, there are particular concerns about the appropriateness and acceptability of medication treatment as they prepare to take over the management of their mental health treatment. This dissertation study focused on better understanding the pathways and patterns of medication use in this older group with a specific focus on how these varied by race. Overall, the study results were different than anticipated, with fewer racial differences in the specific connections to medication treatment than had been hypothesized and no racial difference in the direct relationship between need and medication treatment or in the types of medications youth were taking. Medication use subgroups were identified but were generally characterized by relative stability rather than frequent changes. The analyses highlight the importance of need in relation to medication treatment and the importance of better understanding complex mental health needs in order to ensure appropriate treatment. The following chapter presents a discussion of the findings for each aim of the study, identifies limitations, then synthesizes the results to discuss implications for future research, theory, practice and policy.

Paths to Medication Use: Aim 1

Mental Health Need

One of the first findings that emerged from this study was the challenge of capturing mental health need in the older youth population. The construction and measurement of mental health need has long been a challenge for researchers attempting to capture prevalence of mental health need and its relationship to service use (Costello et al, 1993). The gold standard for assessing mental health need has been population based diagnostic measures designed to assess the prevalence of diagnoses in the population. The assumption of this approach is that a mental health diagnosis indicates a need for service. Other approaches have included measuring functional impairment or targeting risk factors as an indicator of need (Costello et al, 1993). This

study took a hybrid approach that considered multiple different types of diagnoses and measures of symptoms in an attempt to better capture the mental health needs of older foster youth. Hypotheses were proposed in relation to how underlying externalizing and internalizing problems would be related to medication use.

The first challenge to testing the proposed hypotheses arose in fitting a measurement model of mental health problems that distinguished between internalizing and externalizing problems. Prior research has pointed to differences in service use by race with respect to differences in internalizing and externalizing disorders (Gudino et al, 2009). The high rates of comorbidity across measures of mental health need in this sample, however, resulted in an inability to actually model internalizing and externalizing problems separately. While comorbidity among internalizing and externalizing problems was expected and has long been recognized as a phenomenon in adolescent psychiatric diagnosing (Angold et al, 1999), the correlation among the constructs in this population were so high that the two constructs could not be modeled separately. The problems experienced in the creation of the measurement model for these analyses likely reflect the real world challenges of properly diagnosing older foster youth and determining an appropriate course of mental health treatment. They are some of the highest risk youth in the foster care system – youth that have not been able to successfully reunify with family or be placed into adoptive homes. In addition, some of these youth may be in the foster care system precisely because their families were unable to manage their complex mental health needs. The mental health needs of older foster youth, therefore, are likely higher than the overall group of youth in foster care and the high rates of comorbidity observed in this sample are one indicator of the particular challenges of providing services to the older youth population.

Racial Differences in Mental Health Need

In addition to the complicated clinical picture overall, this study provided some evidence that racial differences are a factor in understanding the mental health needs of the older foster youth population. The level of mental health problems modeled as a single latent variable in this analysis was higher in the white youth than in youth of color. This is in line with previous

analyses from both the Voyages (McMillen et al, 2005) and Midwest study (Garcia et al, 2011) where white youth aging out of foster care had higher rates of mental health diagnoses than youth of other races. This difference suggests two different potential explanations. One is that white older foster youth truly do have higher mental health needs than their peers of other races. This may be the end result of disproportionality in the system where African American youth are more likely to be placed in out of home care than their white counterparts (Hill, 2006). White youth who enter and remain in the system may represent some of the most extreme cases and hence exhibit higher levels of maltreatment and higher rates of mental disorders than their African American peers, leading to a concentration of need in the white group. The finding that white youth have higher levels of mental health problems is also consistent with the ideas from differential assortment theory (Drake, Lee & Jonson-Reid, 2009) which posits that white youth who experience adverse outcomes such as contact with the child welfare system are likely to have fallen through more safety nets than their African-American peers. The structural barriers that youth of color encounter mean that they are likely to live in areas of more concentrated poverty and to be exposed to more risk compared to their white counterparts. White youth that do enter the foster care system, therefore, are more likely to have greater severity of problems and to have biological risk factors such as mental disorders rather than environmental risk factors such as poverty and low access to resources.

An alternate explanation is that the problem is in the measurement of mental health need. Because diagnoses in this study are based on youth's self-report of symptoms, there may be racial differences in the likelihood of reporting symptoms. In the structural equation model, several covariates were negatively related to mental health problems for youth of color but not white youth. These included being male and living in St. Louis City. Prior research has found that African American males, particularly those in urban settings, are less likely to report a need for mental health services (Lindsey, 2006). It is possible that these youth were less likely to endorse symptoms on the DIS even when they were present and therefore failed to meet criteria for a diagnosis. This may have resulted in underreporting of the levels of need, particularly for

African American males in this study. The higher reported levels of mental health need in the white group, therefore, may also indicate a failure to accurately detect need in youth of color.

Relationship between Mental Health Need and Psychotropic Medication

Given the large difference in the rates of medication use between youth of color and white youth (27% vs. 47%), it was notable that the strength of the relationship between mental health need and psychotropic medication was not significantly different between the two racial groups. The Institute of Medicine has defined disparities as differences in the quality of health care that are not related to differences in clinical needs or preferences (IOM, 2003, p.4). Based on the similarity of the relationship between clinical need and medication use in this analysis, the racial difference in the rates of medication use observed in this study appear to be the result of true differences in clinical need rather than the result of disparities. White youths reported higher rates of mental health problems and the higher medication use rates reflect their higher levels of reported need. These findings are in contrast to previous analyses with these data using logistic regression, where race was a significant predictor of medication use, even when controlling for need (McMillen et al, 2004). The difference observed in the current analysis likely reflects the different conceptualization and measurement of mental health need. This dissertation study created a latent variable for mental health problems using all diagnoses and the affect regulation scale compared to the previous analysis which used a dichotomous indicator of any diagnosis. The measure of mental health problems constructed in this study is more difficult to explain than simply a history of a diagnosis, however, it appeared to more effectively capture the relationship between need and medication use. This strengthens the idea that more complex measures beyond diagnosis are needed in order to truly represent need in this population.

Relationship between Mental Health Need and Facilitating Situations

The original hypotheses proposed that there would be racial differences in the types of settings where youths with mental health problems were likely to get treatment and that these would be differentially associated with medication treatment. The study found racial differences in the paths to different types of treatment but not as hypothesized. Given previously reported

higher rates of psychiatric hospitalization use among white youth in foster care (McMillen et al, 2004), this dissertation study hypothesized that white youth would be more likely to receive this treatment and to receive medications through connection with the psychiatric hospital. Instead, the relationship between mental health problems and psychiatric hospitalization was significantly stronger for youth of color. This strong relationship may indicate a failure to identify mental health problems in youth of color prior to escalation to a crisis episode. Prior research on child and adolescent use of the emergency room for mental health care have found that African American youth are more likely to utilize the emergency room as an access point for mental health care than other racial groups (Lindsey et al, 2010; Snowden et al, 2009). This was not true for youth in foster care, however, in Snowden's study (2009). It is somewhat surprising, therefore, that this relationship was observed in these results where youth should be regularly in contact with providers who might recognize problems and direct them to care. Further investigation of these differences is warranted in future research.

Facilitating Situations and Medication Use

An initial hypothesis of the study was that contact with other types of mental health treatment including outpatient therapy, residential treatment and psychiatric hospitalization would act as "facilitating situations" because youths in these settings are assessed by providers who are conducting mental health assessments and potentially connecting them with medication treatment. Overall, however, this hypothesis was not supported. The only setting that acted as a mediator was psychiatric hospitalization for youth of color and even this relationship did not reach statistical significance when bootstrapping methods were used. Based on these results, these treatment settings do not appear to be acting as a route for access to psychotropic medications. This may reflect the fact that many youth who utilize these services are already using medications and the strong relationship between mental health treatment settings and medication use is attributable to need rather than treatment setting. This conclusion is strengthened by the fact that even direct relationships between these facilitating mental health treatment settings and

psychiatric medications were generally not significant. These findings are in line with the ideal in which treatment is provided in response to need rather than placement setting.

The few points in the model at which the relationships between facilitating situations and psychiatric medications were significant did differ by race. Psychiatric hospitalization was related to medications for youth of color and outpatient therapy and medications were related for white youth. The fact that youth of color were more likely to get medications in relationship to psychiatric hospitalization means that some of these youth are likely getting medications in response to a crisis incident. While it is difficult to precisely pinpoint the reason for this difference, it falls in line with prior research related to racial differences in youths' presentation of symptoms (McCoy, 2010) and providers' interpretation of these symptoms (Stiffman et al, 2001). This suggests that providers may fail to recognize mental health symptoms in African American youth prior to a mental health crisis. Alternatively, these youths may resist engaging in mental health treatment until symptoms reach a crisis level. Further research is needed to establish and further investigate the reason for the relationship observed in this study between race, psychiatric hospitalization, and medication treatment.

An additional point of difference between white youth and youth of color in the model was in the relationship between outpatient therapy and medication use. Best practice guidelines related to psychotropic prescribing for youth in foster care state that medication treatment should be provided in conjunction with therapy or other psychosocial interventions (AACAP, 2005; Naylor et al, 2007). The fact that there was no relationship between these services for youth of color is potentially an indicator that these youth are less likely to receive treatment in line with this recommendation. Bivariate examination to further investigate whether youth of color on medications were less likely to have had outpatient therapy confirmed that youth of color had lower rates of concurrent therapy than white youth – 77% of white youths who received medications had also had therapy in the past year compared to 63% of youths of color. More research is needed to investigate the source of this difference to determine whether this indicates lower quality mental health treatment for youth of color or different preferences for treatment.

Regional differences

The fact that race and geographic region are closely linked in the Voyages data makes it difficult to separate racial differences from regional differences. Due to residential segregation in the St. Louis area, race and geographic region are closely intertwined. Very few white youths in the sample were actually living in St. Louis City ($n=14$) so there was limited power to detect differences for white youth based on region. For youth of color, those who lived in St. Louis City were more likely to use emergency psychiatric care and less likely to have outpatient therapy compared to other regions. These patterns mirrored the differences between youth of color overall and white youth. It is unclear, therefore, to what extent regional difference and racial differences are working together to produce different patterns of service use. Future efforts to better understand the sources of racial differences in connections with mental health treatment will need to be designed with the importance of geographic region in mind.

Summary

Overall, analyses in Aim 1 found that there were some racial differences in the paths between mental health problems and mental health treatment but these differences were not in line with proposed hypotheses. The evidence does not support the assertion that there are racial disparities in medication treatment but rather that white youth and youth of color have different levels of need as measured in this study. Some potential quality concerns were raised in relation to a lack of association between therapy and medications for youth of color and the connection of this group with medications in association with more crisis oriented situations. Further investigation is warranted to better understand the role of individual preferences, regional differences, and provider and system level factors in generating the observed relationships between need and treatment.

Patterns of Medication Use – Aims 2 & 3

The second and third aims of the study focused on describing the patterns of medication use for older foster youth between ages 17 and 18. These analyses aimed to better understand medication use patterns over this year and to identify meaningful subgroups of youth with

different patterns of use. From these analyses, several findings deserve further comment including the rates and types of medication use, medication change patterns, and meaningful differences in subgroups with different patterns, including racial differences.

Overall Rates

The overall rate of medication use across the study year was high, with 42% of the sample using a psychiatric medication at some point between ages 17 and 18 compared to national rates for 12-18 year olds of 32% (Rubin et al, 2012). This data is now a decade old (collected between 2001-2005, so current rates may be somewhat different than those reported in this study. Since these data were collected, warnings related to side effects, including Black Box warnings for SSRIs (Friedman & Leon, 2007) and research on metabolic side effects of antipsychotics (Correll et al, 2009) have gained wide spread attention and may have influenced prescribing practices. In a recent review of trends across the 50 states from 2002-2007 using Medicaid data, Rubin et al (2012) found that overall rates rose between 2002-2004, then declined gradually between 2006-2007. In most states, while overall rates, especially rates of antidepressant prescribing declined, the rates for antipsychotics continued to increase across the study period (Rubin et al, 2012). Rates of antipsychotics in Missouri, however, have remained stable since 2003 (Rubin et al, 2012). In spite of these changes, the rates reported in the current study are consistent with those reported in a recent federal report from the General Accounting Office which examined rates from 2008 Medicaid data for foster youth in five states. Rates of medication use across these states for 13-17 year olds ranged from 35% in Michigan to 58% in Texas and were significantly higher than non-foster youth. While there is some indication that medication rates have declined slightly since 2007 (Rubin et al, 2007), the rates of use continue to be high (GAO, 2011) highlighting the ongoing need to consider continuity of psychotropic medications as part of efforts to ensure successful transitions to adulthood for these youth.

Medication Types

An examination of the types of medications that youth were prescribed is instructive in better understanding some of the underlying problems that may be driving high rates of use.

Similar to prescribing patterns in the general population (Thomas et al, 2006), antidepressants were the most commonly prescribed medication and were pervasive across a variety of indicators. Four out of five youths who received a medication, received an anti-depressant (82%), and one fifth of these youth took two antidepressants. No single type of antidepressant dominated prescribing but instead seven different antidepressant medications, accounted for the majority of antidepressant prescribing. The overall rates of anti-depressants used in this study (33%) were higher than those reported in the 12-18 year old group of foster youth nationwide where 20% of youth were taking an antidepressant (Rubin et al, 2012).

While concern in the research literature has focused on the high rates of anti-psychotic use among foster youth (i.e. dosReis et al, 2011), the pervasiveness of anti-depressants deserves some further scrutiny. Anti-depressants are primarily used to treat depression and anxiety, conditions that disproportionately affect older foster youth (Courtney, Terao & Bost, 2004; McMillen et al, 2005) so the high rates of use are understandable. Both anxiety and depression have evidence based psychosocial treatments (Weisz, Hawley & Doss, 2004) so the extensive use of medications may reflect a lack of other available evidence-based treatments. It is not clear from the data in this study what types of psychosocial treatments foster youth were receiving in conjunction with their medications, however, increased focus on providing evidence based treatments may be one avenue to reducing the high rates of psychotropic medication use among foster youths. Psychiatric providers may be turning to anti-depressant medications due to the urgent need to address anxiety and depression and the lack of other types of treatments.

Antipsychotic medications were the second most prevalent class of medication (23.1% overall) and were particularly pervasive among youth in the high use and declining use medication categories. These youth were very likely to take both antidepressants and antipsychotics. In contrast to some recent reports, very few youth were taking multiple antipsychotic medications together. Medicaid data from one mid-Atlantic state from 2003 found high rates of concomitant antipsychotic prescribing (dos Reis et al, 2011) but this was not the case for the older foster youth in the current study. Rates of antipsychotic use in this sample

were higher than the average across the nation in 2003 for foster youth ages 12-18 of 13.2% (Rubin et al, 2012). These differences highlight the fact that regional variation in rates of psychotropic prescribing (Leslie et al, 2011; Raghavan et al, 2010) extend to the types of medications prescribed as well as the overall rates. Consistent indicators for monitoring the quality of psychotropic prescribing nationwide might be one method for better monitoring and reducing this variation (GAO, 2011).

Stimulant medications were the most stable medications across the year and the only medication class in which significant racial differences were noted. The relative stability of these medications is not surprising given that they have been recommended for the long term treatment of ADHD, often viewed as a chronic condition. The benefits of a long term approach to the use of ADHD medication has been questioned (Sroufe, 2011), however, so this prescribing may be another target for reducing the number of medication youths take. In this study, ADHD was associated with being in the high use medication group. Half of the youth in this group were taking a stimulant. ADHD and stimulant use in many cases went along with use of a host of other medications and comorbid conditions, but stimulants were the medications that remained most stable. Given that much of the attention around psychotropic medication use in the general youth population has focused on ADHD and stimulant medications, it is worth noting that stimulant use made up a relatively low percentage of the overall use for older foster youths in this sample. The relatively low rates are in contrast to older adolescents in the general population (Thomas et al, 2006) and the broader foster youth population (Rubin et al, 2012) where stimulants were the second most commonly prescribed medications after antidepressants. In this study, stimulants were often used in combination with other types of medications as would be expected since ADHD is often comorbid with other disorders (Angold et al, 1999).

Medication Changes

Few prior studies have reported on how often youth change medications. This dissertation study reported on changes in the overall rates of use and on changes within medication treatment regimens. Rates of medication treatment declined modestly over the study

year, in line with previous research (McMillen & Raghavan, 2009), though over half of the youths in the study remained on a medication for every month of the study year. Most of those who took medications, however, experienced at least one change in their regimen over the study year. Less than 20% of those who took medications in the sample had no changes at all across the study period. This likely reflects the nature of psychiatric medication treatment which often involves trying multiple different medications before finding a medication that both works well and has minimal side effects. In this study, this process often occurred over multiple months. Almost half of the youths who took medications had medication changes in multiple months throughout the year with one youth reporting changes in 6 months of the study. These change patterns are not necessarily an indicator of quality problems, however, they do speak to the experiences with medication treatment that may be shaping perspectives on psychotropic medications as youths take over the management of their own treatment. In a conference presentation on the perspectives of medication treatment for youths who had exited public systems, Narendorf & Munson (Society for Social Work Research, 2012) reported that young adults talked about medication treatment as a “trial and error” process in both positive and negative ways. For some young people, this process led to finding the right medication while for others it led to frustration and skepticism about the legitimacy of medication treatment (Narendorf & Munson, 2012). Providers should be aware of the impact that medication changes may have on youth’s perceptions of medication treatment.

The multivariable model identified a number of variables that were significantly related to higher numbers of medication changes. Several indicators of problems in functioning were associated with a higher number of changes including criminal justice involvement and school problems. These are externalizing problems that are likely to cause significant disruption so medication changes may be a response. Females were also more likely to experience higher numbers of medication changes. This may reflect a difference in the interpretation of problem behaviors by gender where problem behaviors in girls are attributed to a mental health problem requiring a medication change rather than a behavioral problem. The variables associated with

higher numbers of medication changes were on the whole, significantly different than those associated with taking medications or not. Once youth were on medications, their experiences with the stability of the treatment were associated with problems in functioning rather than in diagnoses. Further exploration of how to characterize the nature of medication treatment episodes and better understand the role of gender and functioning is warranted in future research.

Subgroup Differences

Four different subgroups of youth with different medication use patterns were identified using latent growth mixture modeling – a low/no use group, a medium stable use group, a declining use group, and a high stable group. The majority of youth in the study were classified into a medication use group characterized by relatively stable patterns of use. As previously reported, many youths had medication changes over the study period, but the number of medications used each month was relatively stable. Just over half of youths (52%) who used a medication over the study year were continuous users who took a medication in all twelve months of the study. Medication use subgroups reflected this relative stability. Not surprisingly, the most significant differences between groups were between the low/no use group and the other groups. The low use group was distinct from the other three groups in that they had lower rates of mental disorders, lower rates of living in congregate care, maltreatment, and involvement with other types of mental health treatment. These differences all indicate that medication users were a group with higher treatment needs than youths who used few or no medications throughout the year.

Among medication users two distinct groups of stable users emerged – those who consistently used a high number of medications (average 3.8) and those who used a moderate amount of medications (average 1.8). High users differed from medium users primarily in their rates of comorbid behavioral disorders including lifetime diagnoses of ADHD and past year diagnoses of disruptive behavioral disorder. The types of medications they took reflected these patterns as previously noted – youth in the high use group were more likely to be taking

antipsychotics, mood stabilizers, and stimulants in combination with antidepressants compared to medium users who primarily took antidepressants.

A small group of medication users was characterized by declining use. The declining use group looked most similar to the high use group in terms of types of medications, risk factors and mental disorders. The original hypothesis had been that youth who discontinued medications while still in child welfare custody would be less severe than stable users. This hypothesis was based on the assumption that discontinuation of medications while youth were still in care would be the result of lower need. In fact, the declining use group most resembled the more severe, high use group. They had the highest rates of physical abuse and neglect among the three groups and almost all of them were in congregate care settings at age 17. Over the course of the study year, they had more months with placement changes than any of the other groups, potentially indicating that these youths had trouble maintaining placements or were making placement moves prior to leaving care. They were most likely to have exited care by age 19 and disproportionately dropped out of the study prior to the final interview. These may have been youths who were already on their way out of care during the study year and the medication discontinuations could be a response to changing circumstances rather than a lack of clinical need. At age 19, however, the relatively small number of these youths who were still in the study did not meet criteria for any past year disorders and none reported a psychiatric hospitalization so it is also possible that these youths suffered from more episodic types of disorders that no longer required medication.

Examination of outcomes at age 19 provided some evidence that the stable medium use group fared better than other groups. At age 19, these youths were most likely to have remained in custody compared to all other groups and they were most likely to be engaged in employment or work, even when controlling for state custody status. Compared to youths in the high using medication group, they also had lower levels of depression. While far from conclusive, these results suggest that medications may play a role in beneficial outcomes for this particular group of

youths who had less complicated mental health needs (fewer comorbidities) than the high using groups and exhibited patterns of moderate, relatively stable medication use.

The four groups identified in this analysis were both similar and distinct from prior findings using latent growth mixture modeling with the NSCAW data (Leslie et al, 2010). This dissertation study utilized a count of medications examined monthly compared to Leslie's study which used a dichotomous yes/no indicator measured annually over three years with a broader and younger population of youths in child welfare. Both studies identified a low/no use group that included the largest percentage of youths in the study – 85% in the NSCAW study compared with 73% in the current study. While Leslie's study found a small group that initiated medications after entering foster care, the current study identified a group that were discontinuing use as they moved closer to leaving care – 4% of the youths in each of the study samples. The stable use groups identified in this study are similar to Leslie's high use group (12%) in which youths continued use over multiple study waves. This study identified two stable groups distinguished by medium and high numbers of medications used. The comparability of the findings of the two studies lends support to the current findings which used much more detailed measures but a smaller sample than the more than 2,500 youths in Leslie's analysis. Both studies support the idea that there are subgroups of youths with different patterns of use in the child welfare system.

Racial Differences in Medication Use Patterns

Racial differences in the rates of psychotropic medication use have been well documented (Ferguson et al, 2006; McMillen & Raghavan, 2009; Raghavan et al, 2005; Raghavan & McMillen, 2008; Zito et al, 2003) but few studies have examined differences in the length and type of this treatment over time. This dissertation study found that the types of medications prescribed to youth over the study year were not significantly different by race. While prior studies have documented lower rates of antidepressant use among African American youth (Zito et al, 2005), the current study found no differences by the type of medications prescribed once youth were connected with medication treatment. What did differ significantly was the length of the treatment. Youth of color were not only less likely to have started on a

medication at the start of the study but were more likely to stop taking medications over the study year. The gradual decline in rates of medication use for all youth between ages 17 and 18 appears to have been driven primarily by a decline in rates among youth of color. These shorter lengths of treatment among youth of color have not been documented in prior studies to the knowledge of this investigator, though few prior studies of foster youth have examined length of treatment at all. In the recent study by dos Reis and colleagues (2011) focused specifically on antipsychotic use, no differences in the length of treatment were identified by race. Further investigation is warranted to identify whether the pattern identified in this study is unique to older foster youth or to this particular geographic region.

The fact that youth of color tended to discontinue use may speak to underlying preferences to be off of medications. Mistrust of medical providers and high stigma associated with medication treatment may not only influence youth of color against engaging in medication treatment in the first place (Kranke et al, 2012) but may also result in shorter lengths of treatment. A higher percentage of youth of color in this study reported making the decision to discontinue medication on their own rather than with a medical provider which supports the idea that they may be discontinuing these medications due to individual preferences. Data on reasons for discontinuation also found, however, that youth of color were more likely to report access problems as a reason for discontinuation. Higher rates of discontinuation among youth of color may be the result of several different factors that converge so that youth both have a more difficult time accessing medications and less motivation to overcome these barriers to continue treatment.

Given the nature of these data where all youth were age 17, it is impossible to determine whether the shorter length of medication treatment is a common phenomenon across adolescents in foster care or is particular to youth who are closer to aging out. If these patterns were typical of a broader age range, this phenomenon might also partially explain the lower rates of medication use observed among youth of color at any point in time. Based on these data, it appears that the racial differences in medication rates may be impacted by both lower rates of

initiation and higher rates of discontinuation. At this point, it is not clear whether the higher rates of discontinuation in this group and lower rates of overall use is positive or negative. The fact that youth of color discontinue use may be a positive change reflecting less dependency on psychiatric medications or it may reflect disconnection from treatments that could promote improved functioning. Further investigation is needed to establish whether medication use actually results in positive long term outcomes in order to establish whether long term use is a desirable outcome.

Conclusions Across Study Aims

This study aimed to better understand the psychotropic medication use patterns of older foster youths with a specific focus on racial differences. It was conceived and conducted in an environment in which there has been growing attention to the high rates of medication use and many concerns about the quality of this treatment. As a whole, the findings of this study provide support for medication treatment and treatment patterns that are driven by mental health needs rather than racial differences or other non-clinical factors that would indicate quality problems. The relationship between mental health problems and medication use was not significantly different by race, providing no evidence for the presence of disparities in medication treatment. While a small groups of youth was identified that was characterized by high use of medications, these youth were distinct from those that took fewer medications by the presence of comorbid behavioral disorders rather than by non-clinical factors. While the rates of medication use are strikingly high for youth in foster care, this use appears to be occurring in conjunction with high mental health needs. Efforts to reduce the rates of psychotropic medications in this group of youth need to address the mental health problems that are currently addressed with medications.

Prior work has established that older foster youth rapidly discontinue use after leaving foster care (McMillen & Raghavan, 2009). One challenge in determining how to address this problem is that quality concerns raise questions about whether these youths need medications at all. This study found that youths who were classified into the discontinuing subgroup while in care did not evidence lower levels of need but in fact were characterized by high rates of mental

disorders and psychiatric hospital use. Outcomes for these youths at age 19 were difficult to determine as many dropped out of the study, however, they reported low rates of mental disorders but only one of the seven youths in this category was engaged in work or school. While far from conclusive, the association between moderate, stable medication use and positive outcomes at age 19 suggests that medications may be beneficial for some youths, particularly those with disorders that are effectively treated with anti-depressants. Recent attention to the quality problems in medication use for foster youth has potentially overshadowed the benefits that some youth derive from this treatment. Interventions aimed at improving treatment for older youths in foster care needs to focus on understanding the complex mental health needs of these youths and the role of medications in their treatment.

This study aimed to provide a more nuanced understanding of the medication use patterns of these older foster youth. After in depth exploration of what situations facilitate access to medications and what use looks like over time, the picture that emerged was relatively simple. The strongest predictor of medication use was mental health need and youth with more complex needs (comorbidities) got more medications. The challenge going forward is to determine the appropriate role of medications in addressing these needs. As evidence mounts related to side effects (i.e. Correll et al, 2009) and the long term effectiveness of medications in promoting better functioning remains in question (Whitaker, 2010), there is an ongoing need to determine how medications should be utilized and for how long. The high rates of use and high numbers of medications used in treatment have highlighted the need to look closely at this use particularly in foster youth. As the child welfare system takes an increasingly active role in monitoring medications for the children they serve, they will be at the forefront of this issue. Effective multi-faceted interventions for older foster youth are needed that consider medications within the broader context of other types of psychosocial treatments to address the complex needs of older youth documented in this study.

Strengths and Limitations

Advantages of the Voyages data set

The data used in this study had several strengths to recommend its use over other types of secondary data. First, data on medication use was gathered with sufficient detail to create new variables that allowed examination of types of medications and medication changes by month, data that is not available in large health surveys. Questions about the reason for medication changes and who made the decision to stop provided additional information about these changes. The amount of contextual information (including symptoms and interviewer-derived diagnoses) contained in the data provided the ability to examine a variety of predictors of identified medication use patterns.

Limitations

Several limitations should be considered in interpreting the results of this study. While the dataset was chosen for its unique combination of in depth measures of functioning and detailed information on medication use, the sample size was relatively small for some of the proposed analyses. It prohibited fitting more complex models of growth. In addition, the smaller sample size may have led to underestimation of effects, especially in analyses that examined low frequency outcomes such as particular types of medication use compared by race.

The measurement of mental health problems in this study should also be considered in interpreting the results. The fact that measures of diagnosis came from interviewer derived diagnoses based on youth responses is both a strength and a limitation of the study. The measure has the advantage of being youth reported so that the diagnoses assigned are a reflection of the youth's report of their symptoms without any bias on the part of providers. Providers are often constrained to place youth into a qualifying diagnosis category for billing purposes and the assigned diagnoses may fail to capture the clinical complexity and uncertainty that is actually present. Self-report measures have the disadvantage of relying on the willingness and comfort of the youth to actually report the symptoms they are experiencing. Youth of color

may be less willing to report their symptoms leading to underestimation of their mental health need. The DIS diagnoses assigned in this study, therefore, likely do not align perfectly with the diagnoses that providers are assigning in order to prescribe medications. They provide a particular view of mental health need which comes from youth reports alone.

Another limitations of the data used in this analysis is that its focus was on the youth's experience and therefore little data on providers or the system are available. No information about the characteristics of the youth's caseworker and other mental health providers was available to be included in understanding racial differences. The study, therefore, was able only to identify which types of service situations are associated with medication use rather than providing information about the providers who were the hypothesized mechanism leading from these situations to medication use. No data were available about the knowledge and attitudes of the caseworker or other involved professionals which are important constructs of the gateway provider model. In addition, the measure of attitudes toward medications for youth was only a single item and was not designed for assessing youth's attitudes toward their own medication treatment. Given that individual preferences for medication treatment might have been driving some of the patterns observed in this study, this will be an important construct to measure in more depth in future analyses both for youth and their support systems.

There was also potential endogeneity between medication use and other types of mental health service use in this model. This is a recognized limitation of the study which limits the ability to talk about the direction of these relationships. Because the data used in analysis of medication use at age 17 was cross sectional, the specific time ordering of these variables could not be established. The choice of variables was aimed at minimizing this limitation so that measures of mental disorders were lifetime measures while measures of residential treatment, psychiatric hospitalization, and outpatient therapy were for the past year, and medication use was a current measure. It is recognized, however, that this approach does not fully address potential problems with endogeneity.

Another limitation of the study was the measurement of medication use. The Voyages study data was gathered based on interviews with young people so all data is based on self-report and thus does not contain the prescriber's point of view about the medications. Reasons for discontinuation are solely based on youth report. If a clinical chart review were conducted, the physician reported reason for discontinuation might look very different than that reported by the youth. In addition, the report of the actual medications and medication changes was provided by the youth and is, therefore, subject to more error than if the reports had come from pharmacy or physician records. The validity of these reports are strengthened because youth were asked to provide their prescription containers at the initial structured interviews and to get them prior to answering questions about medications in subsequent phone interviews. One study conducted in a Norwegian sample of adults that examined concordance between self-report and pharmacy records found moderate concordance ($k=.68-.77$), with discrepancies due to under-ascertainment (Haapea et al, 2010). Using youth report does have the advantage, however, of obtaining a report of actual medications taken rather than just those prescribed, a frequent limitation of pharmacy based studies in which adherence with prescribed medications is uncertain.

The Voyages data is also limited in that the type or name of the provider that prescribed the medication was unknown. It is not possible to directly identify when changes in provider were made and whether these changes resulted in changes in medications. Changes in residential status are often associated with changes in provider and these were included in the analysis, however, no measures identified the prescriber directly. The sample was also drawn from one geographic region so results may not generalize to broad patterns of medication use in other states. In addition, the generalizability of these data is limited by their age. Much attention has focused on the wide spread use of psychotropic medications among foster youth since these data were collected between 2001-2005 so the results of this study may not apply to current medication prescribing practices. Recent reports, however, have continued to report similar rates of medication use (US GAO, 2011).

Finally, while the Voyages study provides the ability to describe and characterize medication use patterns, data to examine long term outcomes was limited. The study only followed youth until age 19 and many of the youth were still in state custody at the end of the study. A number of covariates were associated with drop out from the study which limits the generalizability of results to all youth, especially in the declining use medication group which had high rates of attrition. In addition, this study was unable to capture how the experiences of continuity and change that it described actually impacted youth's attitudes and beliefs about the psychotropic treatment and their decisions to continue using medications as they aged into young adulthood. Future research would benefit from inclusion of mixed qualitative and quantitative methods to better understand the impact of these medication use patterns on treatment decisions in young adulthood.

Implications

In spite of these limitations, this study provided new insights into the nature of psychotropic medication use patterns for older foster youth and described racial differences in these patterns. The findings suggest avenues for future research, practice and policy to guide efforts to improve mental health treatment for older foster youths.

Implications for Research

This study found extremely high rates of comorbidity among older foster youths leading to modeling mental health problems as one latent construct. These findings suggest a need to utilize and potentially develop alternative conceptualizations of mental health problems in future studies with this high need population. Future research should include measures of both symptoms and functioning in addition to measures of mental disorders in order to further explore the complex nature of the mental health problems these youth present. Affect dysregulation symptoms were prominent in this study and contributed to the conceptualization of mental health problems for older foster youth. Measurement of this construct is one example of inclusion of symptom measures that are needed in order to understand mental health problems in this group.

This study also provided some indication that attitudes toward medications are related to medication use patterns but the ability to interpret the meaning of these findings was limited by having only one item specific to medication. In order to understand the role of individual attitudes and preferences toward medications, future research should include more comprehensive measures of attitudes specific to medications. While the measure of attitudes toward medication in this study found no racial differences, additional measures are needed to better understand the role of individual attitudes and preferences in the higher rates of medication discontinuation that were observed among youth of color. Qualitative work that provides in depth information about the role of attitudes and preferences in medication use decisions would assist in understanding what generates medication use patterns.

This study was successful in identifying different medication use subgroups whose experiences represented different types of medication use episodes. This supports the feasibility of attempting to characterize medication use in more complex ways that include duration and number of medications used over time. Unfortunately, having only one year of data provided only a piece of these medication use episodes which did not allow complete examination of when medication use episodes started and ended. Future research should examine initiation and discontinuation of medications over a longer time horizon to truly capture the length and nature of medication use episodes. This study was also limited by the relatively small sample size. In order to model more complex patterns of growth, future studies need to include very large sample sizes. Administrative data such as Medicaid data linked to survey data that provides more contextual and clinical information in a large sample of individuals would be an ideal dataset in which to further examine subgroups of medication users.

This study was able to provide additional information about what medication use episodes look like for older youth and how these differ by race, however, it was unable to provide more information about what is driving these differences. Complementary data is needed beyond descriptions of service use episodes to understand what is driving these episodes. Mixed methods that incorporate qualitative interviews and case studies along with administrative and

survey data would assist in better understanding the exact role of individual preferences, caseworker knowledge and preferences, system level administrative practices, and resource availability in generating differences in treatment patterns, particularly racial differences.

Implications for Theory

This study drew on several conceptual models of health service use to advance a proposed model of paths to medication treatment. This model hypothesized that contact with gateway providers in mental health treatment situations would differentially facilitate access to treatment for white youth and youth of color. The results of the study found that other types of mental health treatment did not facilitate access to medications, independent of need, for either racial group. This suggests that mental health providers are not gateway providers in the traditional sense as conceptualized by Stiffman et al (2004), responsible for identifying need and connecting youth with medications. For older foster youth who have likely had many opportunities for access to care through their time in the child welfare system, these providers may play an entirely different role that is not focused on access but rather on monitoring the quality of treatment and assisting in management. Modeling access to medication treatment, therefore, is likely less relevant than examining the nature of service episodes and the role of service providers in directing the course of these treatment episodes. Mental health services research has generally separated access and quality into two different areas of inquiry, however, the question of what types of treatment are accessed by whom and for what needs once youth are engaged in the mental health service system raises issues of both access and quality. Issues of access are raised regarding the processes by which youth are connected with different types of services and issues of quality come in determining whether the types of treatments they are given are appropriate to the needs presented and improve outcomes.

The Network Episode Model (Pescosolido & Boyer, 1999) provides a starting point to begin approaching questions about the intersection of access and quality through the concepts of the illness career and the service use episode. The current study provided information about medication use episodes over the course of one year. Clearly, many youth had previous service

experiences and an illness career in which they had experienced prior attempts to address their symptoms. Service use episodes may have incorporated many different types of services in sequence or in combination. Models that can incorporate ideas of access to different types of services within service use episodes can assist in providing a better framework for understanding service use among youth who have access to many services and complex service needs that may be addressed with a variety of services over the course of treatment. Medication use is one type of service that has been a widely utilized choice especially among foster youth. Examining how this type of treatment is the end result of a service use episode and whether this connection is an appropriate response to need (a quality question) will assist in better understanding leverage points in the system where alternatives could be introduced in order to reduce the high rates of medication use.

Implications for Practice

This study provided some insight into the presentation of mental health need specific to the older youth population in foster care. The high rates of comorbidity in this group lend support to the need for alternate conceptualizations of mental disorders for youth who have experienced trauma. Some trauma researchers have proposed and advocated for a specific diagnosis for complex trauma, an extension of post-traumatic stress disorder that adds symptoms such as severe inattention, anger, and problems with affect regulation (Courtois, 2008). These are symptoms that may present as part of other diagnoses such as bi-polar disorder and ADHD and present challenges for differential diagnosis. Efforts to improve the quality of mental health treatment to older foster youth may need to begin with better assessment practices that go beyond diagnosis-based measures of need to better understand the complex problems they present. Given this complexity and the often long history of attempts to address these needs while these youth have been in foster care, interventions that focus first on in depth re-assessment of mental health needs and treatments may be most appropriate as a base to ensure appropriate care as these youth prepare to leave the system and manage their own mental health treatment.

A better understanding of complex clinical needs can also be used to inform transition planning for these older youth. Legislation now mandates that all youth have transition plans 90 days prior to their exit from care (Fostering Connections for Success Act, Law 110-351, 2008). Careful assessment of mental health needs and preferences related to mental health treatment should be built into this planning process in order to create effective transitions. This planning process could be tailored differently for the medication use subgroups identified in this study. For example, the highest using group of youths in this study would be a natural target for specialized diagnostic assessment to clarify the nature of their mental health problems and complex treatments to better prepare them for managing their mental health in young adulthood. Interventions prior to transition might prevent the abrupt discontinuation of medication treatment for youths with high needs.

This study found some evidence that the patterns of mental health treatment were different for white youth and youth of color. This suggests the need for providers to be aware of the impact of race, ethnicity, and culture on both the presentation and assessment of mental health problems and in subsequent patterns of service use. Deliberate attention to how race may impact beliefs and preferences around mental health treatment, particularly medication treatment, as youth transition to the adult system should be included in conversations around transition planning. Training for providers that assists them in thinking and talking with youth about the role that race and culture play in how they think about their problems and the treatment they need may promote better assessment of underlying problems and plans for treatment that promote engagement.

This study also found that medication changes are the norm for older youth who are treated with medications. While many youth stayed on medications consistently, most had at least one change in their regimen. Providers who are working with youth to provide education about medications and assist in monitoring their effectiveness should be aware of these patterns and help youth to understand that treatment with psychiatric medication is often a trial and error process. Due to the nature of this treatment, child welfare caseworkers, foster parents and the

youth themselves need to be adequately prepared to actively engage in the process of medication treatment and to advocate for medications that are helpful to them. Practice models developed in adults with serious mental illness that encourage a shared decision making approach (Deegan & Drake, 2006), may be especially appropriate for older foster youth. These interventions focus on preparing and empowering the client to take ownership for their own treatment, skills that are very relevant for foster youth transitioning to adulthood.

Implications for Policy

The recent public and policy attention to the issue of psychotropic medication use for youth in child welfare presents opportunities for harnessing this attention to improve the quality of mental health care more broadly. The Foster Connections to Success and Increasing Adoptions Act (Public Law 110-351) passed in 2008 explicitly requires states to plan for the coordination and oversight of medical care for foster youths, specifically including mental health care (House Resolution 6893; Fostering Connections to Success, Increasing Adoptions Act of 2008). Most recently the Child and Family Services Improvement and Innovation Act of 2011 (House Resolution 2883) explicitly required states to develop policies and procedures for monitoring the use of psychotropic medications for youth in child welfare. This federal attention to psychotropic medication use means that states are actively grappling with the best ways to implement these policies, providing very current opportunities to influence policies related to mental health treatment for older foster youth.

Many of the findings of this study provide evidence that psychotropic medication prescribing is related to need. While high rates of medication use have raised concerns about the quality of this use, it is important to account for the fact that this use often occurs in response to demonstrated mental health need. As states implement oversight policies to flag and restrict inappropriate prescribing, more emphasis is needed on policies that effectively respond to the problems that generated the need for medication use in the first place. Better procedures for the assessment and management of mental health problems for foster youth are needed. A number of states have recently begun initiatives that provide a medical home model with centralized care

for youth in foster care with providers who remain continuously involved even when placements or circumstances shift. As these initiatives are implemented, it will be important to specifically examine how these medical homes manage the mental health of foster youth, particularly the use of medications and whether improved continuity and coordination can produce better outcomes. Assessment and coordination of care provided through these medical homes will be insufficient if youth are not linked with effective treatments to address their complex mental health needs. Policies that provide incentives and/ or oversight to ensure the use of psychosocial treatments with the best evidence of effectiveness could also be used to ensure that youth are receiving high quality mental health care. The California Evidence Based Clearinghouse identifies interventions that are supported or well supported by research evidence for treatment of anxiety, depression, disruptive behavioral disorders, behavioral management, and bipolar disorder for youths in child welfare (California Evidenced Based Clearinghouse for Child Welfare, 2012). Policies that ensure older youth are receiving these types of treatments in conjunctions with medication treatment are another route to improve the quality of care.

The Fostering Connections Act (Public Law 110-351) also specifically mandates transition planning 90 days prior to system exit. In order to produce transition plans that effectively support the mental health needs of older foster youth in the three months prior to system exit, policies are needed to ensure that treatment needs are clearly identified and addressed in the years prior to system exit. Since the Foster Care Independence Act of 1999, state child welfare systems have provided supports and training for youth to prepare them for independent living. Policies that explicitly tie preparation and planning related to managing mental health and mental health services into supports for independence could provide a bridge that helps prepare youth to successfully manage their mental health needs. A few interventions have been developed to specifically support youth as they transition out of the child welfare system, some of which specifically incorporate mental health, but none of the interventions identified for older youth transitioning to adulthood on the California Evidence-Based Clearinghouse had enough evidence to be rated (California Evidenced Based Clearinghouse for

Child Welfare, 2012). Policies that encourage the incorporation of mental health into preparation for independent living along with funding priorities that support research on effective interventions can assist in improving the quality of mental health for these youth as they transition into adulthood.

Conclusion

This study examined the pathways and patterns of medication treatment for older youth served in the foster care system in one state. The results of the study provide new information about the nature of psychotropic medication treatment for these youth as they near their exit from state custody. Examination of racial differences found no evidence for the presence of disparities in psychotropic treatment, in spite of very different rates of medication use. Racial differences in the relationships between medications and other types of treatment raise potential quality concerns about how youth receive this treatment which should be investigated in future research. Distinct subgroups of youth with different patterns of medication use emerged with the majority of youth characterized by different levels of relatively stable use. These groups were primarily associated with different types of mental health needs. A small group of youth displayed a pattern of high needs then declining medication use. Transition planning interventions that target high medication users may be able to prevent abrupt medication discontinuation as youth leave and ensure high quality treatment, particularly for this high needs group. Policies and interventions aimed at reducing the rates of medication use need to offer alternative ways to address the mental health needs that contribute to high rates of medication use.

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Appendix A: Sample History Calendar

HISTORY CALENDAR PAGE 2---

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

STUDY ID: 8511029

MONTHS	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
BIRTHDAYS															
INTERVIEWS=I															
LEFT CUSTODY C=left, R=return															
OTHER SERVICES OC=outpatient clinic OP=outpatient professional DI=day in or partial hospital ER=emergency room MD=family doctor CL=clergy SH=self-help SC=school service PO=probation officer															
MEDICATIONS USE FIRST TWO LETTERS OF MEDICATION NAME <i>Gymbitia</i>															
DEPRESSION SCORE	28														

Dep Score: 145