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# Using Geographical Information Systems to Investigate Access to School Mental Health Services

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USING GEOGRAPHICAL INFORMATION SYSTEMS TO INVESTIGATE  
ACCESS TO SCHOOL MENTAL HEALTH SERVICES

by

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Bachelor of Arts  
Ohio University, 2010

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Submitted in Partial Fulfillment of the Requirements

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## ABSTRACT

Many youth present emotional or behavioral difficulties at levels that necessitate mental health services, yet few receive these needed services. However, school mental health services are thought to improve access to mental health services for youth and families over and above traditional community mental health centers. The purpose of the current study was to expand on existing research by examining community-level and geographic predictors of the utilization of school mental health or community mental health services. Within the context of a large, federally funded trial, I examined how community rurality, ethnic/racial makeup and drive time predicted the use of either school mental health or community mental health services while controlling for county of residence and median household income. Service utilization at schools versus the community mental health center was not predicted by the community- or geographic-level predictors examined in the current study. However some interesting descriptive findings did emerge that may lend preliminary support to the notion that school mental health services help improve geographic accessibility for those youth that live furthest from the community mental health center. Implications for future research are discussed.

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## LIST OF SYMBOLS

$M$	Mean.
$SD$	Standard deviation.
$n$	Sample size.
$r$	Correlation.
$df$	Degrees of freedom.

## LIST OF ABBREVIATIONS

CMHC.....Community Mental Health Center

SMH.....School Mental Health

## CHAPTER 1

### INTRODUCTION

Twenty percent or more of youth present emotional or behavioral symptoms at levels that necessitate intervention (for review see Marsh, 2004). Yet, as few as one-sixth of youth with diagnosable disorders receive treatment (Burns et al., 1995; Leaf et al., 1996). In addition, once youth and families engage in treatment, many of those receiving outpatient services attend limited sessions and drop out swiftly (Harpaz-Rotem, Leslie & Rosenheck, 2004; McKay, Lynn & Bannon, 2005). Given that few youth receive adequate treatment in traditional community mental health centers and that there are numerous barriers to receiving such treatment, other service settings for youth and families have been explored.

Many children and youth who receive mental health services, receive them in the school setting (Merikangas et al., 2011; United States Department of Health and Human Services, 1999; Rones & Hoagwood, 2000) and it is suggested that schools increase access to mental health services above traditional community mental health centers (CMHCs; Weist, 1997; Weist, Myers, Hastings, Ghuman, & Han, 1999), especially for youth that are less likely to receive traditional mental health services (e.g., minorities, individuals in rural regions; Angold et al., 2002; Clauss-Ehlers, Weist, Gregory, et al., 2010; Juszczak, Melinkovich & Kaplan, 2003; Owens, Watabe and Michael, 2013). This is likely related to literature suggesting that school mental health (SMH) programs reduce stigma associated with seeking mental health services (Kataoka et al, 2003), and provide

a more naturalistic, ecological context for helping youth and families (Atkins, Adil, Jackson, McKay, & Bell, 2001). However, little has been documented about the access advantages of delivering mental health services in schools versus in CMHC. That is, are services in schools more geographically accessible than CMHC services when considering drive time to the facility? What community characteristics, such as community race/ethnicity and rurality, predict the use of SMH versus CMHC services? These questions examined at the community level, in contrast to the individual level, may assist policy makers in allocating limited resources to regions more responsively. That is, understanding attributes of communities, such as the racial and ethnic makeup of a community, that impact access to services, may aid in making policy decisions.

Given that SMH programs are thought to increase access to mental health services over and above traditional community mental health services (CMHC; Angold et al., 2002; Clauss-Ehlers, Weist, Gregory, and Hull, 2010; Juszczak, Melinkovich & Kaplan, 2003; Owens, Watabe and Michael, 2013), this paper aims to examine the community and geographic factors that may impact the utilization of SMH services for youth and families. First, youth mental health needs, access to traditional mental health services and the potential of SMH to bridge the gap between mental health needs and service access and utilization are reviewed. Then, predictors of utilization of traditional CMHC services versus SMH services in the context of a large, federally funded trial aiming to improve the quality of SMH services are examined. Data and analyses for the current study which incorporates geographic analysis techniques that are novel to the field of SMH are described. Finally, results are presented in the context of implications for further research and translation to impact public policy.

## **Need for Mental Health Services**

### **Prevalence of mental health problems**

In a recent, nationally representative sample of over 10,000 adolescents aged 13 to 18 in the United States, the estimated lifetime prevalence of at least one mental health disorder was 49.5% of the total sample (Merikangas et al., 2010a). Anxiety disorders were the most prevalent disorder (i.e., 31.9%) followed by behavior disorders (i.e., 19.1%), mood disorders (i.e., 14.3%), and substance use disorders (i.e., 11.4%; Merikangas et al., 2010a). In addition, 40% of children and youth met criteria for more than one mental health problem and 27.6% of youth presented with severe impairment (Merikangas et al., 2010a) at some point in their lives. Similarly, in a large, nationally representative study of children and younger adolescents aged 8-15, approximately 13% of children and youth met criteria for at least one mental health disorder (Merikangas et al., 2010b). The three most prevalent disorders identified were Attention Deficit/Hyperactivity Disorder (i.e., 8.6%), mood disorders (3.7%), and conduct disorders (i.e., 2.1%; Merikangas et al., 2010b).

Mental health problems affect the child and adolescent population broadly, yet, manifestations may differ depending on a variety of factors. For example, evidence suggests that males are more likely to receive a mental health diagnosis than females, with some estimates suggesting that males are 1.7 times more likely to receive a mental health problem diagnosis than females (Merikangas et al., 2010b). In general, females tend to present with mood and anxiety related difficulties more than males while males present more with behavioral and substance abuse disorders (Merikangas et al., 2010a).

In addition, several mental health problems increase in prevalence as children age, such as mood, conduct and substance abuse disorders (Merikangas et al., 2010a; 2010b).

Further, in regard to race and ethnicity, Mexican American youth have been indicated to have lower rates of ADHD and higher rates of developmental disabilities when compared to non-Hispanic, white youth while non-Hispanic, black youth have demonstrated higher rates of anxiety disorders and lower rates of substance use disorders when compared to non-Hispanic, white youth (Merikangas et al., 2010a, 2012b). And Hispanic adolescents have presented with higher rates of mood disorders as compared to non-Hispanic white adolescents (Merikangas et al., 2010a). Therefore, differences exist in the prevalence of diagnoses for specific disorders related to individual demographic factors; this is important in the consideration of identification of mental health problems which precede receipt of mental health services.

### **Access to Mental Health Services**

Despite the prevalence of mental health problems among children and youth, many do not receive needed mental health services. Community-based epidemiological studies suggest that about 6.0 – 7.5% of youth in the general population access mental health services (Kataoka, Zhang, and Wells, 2002), with most children and youth, even with more intensive problems, not receiving services (Burns et al., 1995; Kataoka, Zhang, and Wells, 2002). While these community-based studies suggest a gap between service need and service use, large-scale, nationally representative epidemiological studies of children and youth in the continental United States were not conducted until more recently (Merikangas et al., 2010b, 2011). These studies further support the community-based studies and suggest that only about one third of adolescents and half of children

aged 8-13 receive any mental health services when a mental health issue is present (Merikangas et al., 2010b, 2011).

For example, of the youth and families that contact community mental health facilities for services, upwards of 1/3 fail to attend the initial intake appointment (Harrison, McKay & Bannon, 2004; McKay, Lynn, & Bannon, 2005; McKay, McCadam, & Gonzales, 1996). Once youth and families engage in treatment, many of those receiving outpatient services attend few sessions (Harpaz-Rotem, Leslie & Rosenheck, 2004; McKay, Lynn & Bannon, 2005). Given the critical need to investigate factors associated with treatment engagement and receipt of ongoing mental health services, predictors of this have been identified at the individual, community and geographic levels.

**Individual-level factors.** At the individual level, numerous demographic characteristics of youth and families have been implicated as impacting mental health service utilization including factors such as age, gender, race/ethnicity, diagnosis, level of impairment, and socioeconomic status. In the above-referenced study in a nationally-representative sample of over 3,000 youth aged 8-15 years of age (Merikangas et al., 2010b), diagnosis, age and gender impacted the utilization of mental health services. Youth with externalizing problems, such as ADHD and Conduct Disorder, more frequently received mental health services (i.e., 46.4 – 47.7%) than youth with internalizing disorders (i.e., 32.2 – 43.8%). In addition, rates of receiving mental health services were slightly greater for youth that had greater impairment. These findings are similar to results found in other studies. In another large-scale study of over 1, 000 adolescents with anxiety and depressive disorders, Essau (2005) suggests that up to 80%

of youth with anxiety disorder diagnoses did not receive mental health services. In a similar, nationally representative sample of over 6,000 adolescents, youth with externalizing problems more frequently received services than those with anxiety disorders (i.e., 45.4 – 59.8% vs. 17.8%; Merikangas et al., 2011). Similarly to youth with anxiety disorders, adolescents with substance use, eating and mood disorders less frequently used mental health services than youth with externalizing disorders (Merikangas et al., 2011).

In regard to gender and age, boys are more likely to receive mental health services than girls (Merikangas et al., 2010b). However, there is evidence that female adolescents are more likely than male adolescents to receive mental health services for anxiety disorders and eating disorders (Merikangas et al., 2011). And in general, older children are more likely to receive mental health services than younger children (Merikangas et al., 2010b; Witt, Kasper & Riley, 2003).

Similar to the literature pertaining to adult use of mental health services (for review see Snowden and Yamada, 2005), there are disparities in service utilization when considering cultural factors such as race and ethnicity. Minority youth have lower rates of treatment use in comparison to non-Hispanic, White youth. In comparison to non-Hispanic, White youth, Black, Hispanic and other multiracial adolescents are less likely to receive mental health services (Angold, Erkanli, & Farmer, 2002; Kataoka, Zhang & Wells, 2002; Merikangas et al., 2011; Witt, Kasper & Riley, 2003). Further, in comparison to Whites, Hispanic and Black youth were less likely to have frequent visits for mental health services (i.e., a lifetime rate of greater than 20 visits) and more likely to

have no one designated for coordinating their care (Merikangas et al., 2011; Witt, Kasper & Riley, 2003).

Moreover, in addition to the individual and demographic and cultural factors, there have been general barriers to accessing mental health services that have been identified in the literature. Owens and colleagues (2002) utilized a structured interview with parents of youth that needed mental health services to assess perceived barriers to the receipt of mental health services. Results suggested that there are three types of barriers that prevent youth and families from receiving treatment: structural barriers, perceptions related to mental health difficulties and barriers related to perceptions about mental health treatment. Structural barriers include things such as a lack of mental health providers, lengthy waiting lists for services, insurance or payment challenges, and a lack of transportation. Perceptions related to mental health difficulties include perceptions that the youth's mental health problem is not severe enough to warrant treatment or that the problem can be handled without services. Similarly, it may be that no one realizes or identifies that a youth has a mental health problem in the first place. And finally, barriers related to perceptions about mental health treatment may include stigma related to mental health treatment, mistrust of mental health providers or a previous negative experience with mental healthcare. Indeed, in this study, various barriers were endorsed. Perceptions about mental health services were indicated most frequently as a barrier to treatment (25.9%) whereas barriers related to structural constraints and perceptions about mental health difficulties were each indicated by about 20% of participants. However, although individual- level factors have a critical impact on access to mental health services, most

studies of health disparity focus on predictors at this level and fail to account for broader community and geographic factors (Osypuk, 2013), reviewed next.

**Community and geographic factors.** Like individual-level factors, community-level factors such as the percentage of the population that is of minority status, the rurality of the community and other geographic characteristics, such as drive time to a mental health service, all impact access to and utilization of mental health services as will be reviewed below. Similarly, geographic factors are “concerned with the identification and explanation of spatial structure, pattern, and process, and with the analysis and explanation of the links between humans and the environment” (Moore & Carpenter, 1999, p. 143; Mayer, 1983). To study geographic influences, a number of methods have been used, including the Global Positioning System (GPS), satellite remote sensing, and geographic information systems (GIS). Geospatial data are widely available and highly related to health services research. Through geospatial data we can begin to create a picture of the geography of disease and this can inform our understanding of the etiology, transmission, prevalence and treatment of disease (Richardson et al., 2013). More specifically, a geographic information system (GIS) enables the organization, analysis and display of geographically referenced information. A GIS, “also permits the integration of multiple layers of interdisciplinary spatial data, such as health, environmental, genomic, social, or demographic data, for interactive spatial analysis and modeling” (Richardson et al., 2013, p. 1390). This allows for modeling that can answer complex, multidisciplinary research questions, such as examining the epidemiology of HIV and related access to needed services (e.g., Brouwer et al., 2012), immigrant infant health inequalities (e.g., McLafferty, Widener, Chakrabarti, & Grady, 2012), and the

transmission of malaria between humans and animals (e.g., Wesolowski, 2012), to name a few.

Specific to the research questions in this paper, geographic dimensions of access to care are availability and geographic accessibility (Fortney, Rost & Warren, 2001; Penchansky & Thomas, 1981). Availability refers to the supply of health care providers in a geographic area while geographic accessibility is described as the travel time to healthcare facilities (Penchansky & Thomas, 1981). In general, it is suggested that 30 minutes or less is a feasible time-to-service standard for access to care, although this is often only applied to primary care (Arkansas Center for Health Improvement, 2013; Jacoby, 1991; McCarty & Farris, 2013). In relevant literature, Fortney, Rost, Zhang and Warren (1999) found in a sample of adults with depression, longer drive time to a mental healthcare provider was associated with attendance at fewer sessions. In addition, the average drive time to services at a primary care facility was 20.4 minutes ( $SD = 24.0$ ) in comparison to drive time to a specialty mental health center at 37.8 minutes ( $SD = 46.2$ ), suggesting that services were not accessible to over half of participants utilizing specialty mental health service because they were not at or under the recommended time-to-service standard for access to care (i.e., 30 minutes; Arkansas Center for Health Improvement, 2013; Fortney, Rost, Zhang and Warren, 1999; Jacoby, 1991; McCarty & Farris, 2013).

Living in rural regions influences the use of mental health services with use of services being lower in rural than non-rural areas (for review see Rost, Fortney, Fischer, & Smith, 2002). Rural communities, as compared to urban and suburban regions, tend to have fewer mental health services available, thus decreasing geographic accessibility (Cohen & Hesselbart, 1993; Gamm, Stone & Pittman, 2008; Merwin, Hinton, Dembling

& Stern, 2003; Weist et al., 2000). Alternatively, it has also been documented that there may be cultural factors such as stigmatizing attitudes around mental health services that influence the use of these services in rural areas (Hoyt, Conger, Valde & Weihs, 1997). For example, African Americans in rural areas, in comparison to urban areas, are more family-centered and may rely on family members for support in difficult times, and may be more skeptical about the benefits of professional mental health services (Brody & Flor, 1997; Kumpfer & Alvarado, 1995; Wagenfeld et al., 1994).

Similarly, racial and ethnic make-up of a community also influence the utilization of services. Racial segregation is the “physical separation of the races in residential contexts” (Williams & Collins, 2001, p. 405). In 2011, a report was released based on the 2010 United States Census that described the persistence of racial segregation in metropolitan regions (Logan & Stults, 2011). The findings of this report suggest that there continues to be a great amount of racial segregation in the United States, with the average non-Hispanic, white individual living in neighborhoods that are 75% white, 8% black, 11% Hispanic, and 5% Asian. Alternatively, the average Asian lives in a neighborhood that is 22% Asian, 49% white, 9% black, and 19% Hispanic. Segregation is most notable for African Americans and Hispanic individuals with the average black individual living in a neighborhood that is 45% black, 35% white, 15% Hispanic, and 4% Asian and the average Hispanic individual living in a neighborhood that is 46% Hispanic, 35% white, 11% black and 7% Asian.

In communities that are predominately comprised of racial and ethnic minorities, there are often poorer resources and higher crime rates (Logan & Stults, 2011). In addition, neighborhood segregation and other neighborhood effects associated with

neighborhood segregation, such as lower socioeconomic status, have been associated with poorer health outcomes (for review see Pickett & Pearl, 2001). Not surprisingly, there are differences in where minorities, in comparison to white individuals, seek health services. For example, minorities and whites tend to receive services in different hospitals with suggestions that this may be due to differences in where minorities tend to live (McClellan & Staiger, 1999). Moreover, these poorer areas with high racial segregation lack resources to provide mental health services in the community which decreases access (Chow, Jafee & Snowden, 2003; Snowden, 1999). However, there are few studies that focus on how neighborhood effects impact children and adolescents, thus more targeted research is needed in this area (Sampson, Morenoff & Rowley, 2002).

### **School Mental Health**

As it is recognized that youth are not reaching traditional mental health services and numerous barriers to accessing services have been identified, other more naturalistic service settings, such as schools, are being explored (Weist & Ghuman, 2002). There is evidence that SMH programs are growing in the United States and internationally (Foster et al., 2005; Weist & McDaniel, 2013; Weist & Murray, 2008). For example, in the Child and Adolescent Mental Health Atlas project (World Health Organization, 2005) in which information was collected systematically from countries about existing services and resources, public schools were commonly identified as the primary delivery site for mental health services for youth. In a survey of 83,000 public schools in the United States, Foster and colleagues (2005) found that a majority of schools had staff that provided an array of mental health services including assessment, behavioral

consultation, crisis intervention and individual therapy for youth in general and special education.

Expanded school mental health (SMH), reflects a comprehensive array of mental health services from mental health promotion to prevention of mental health problems, early intervention, and targeted intervention, as well as assessment and case management for students in both general and special education (Weist, 1997). SMH is built on interdisciplinary collaboration amongst school and community employed professionals such that the community providers augment the work of school-employees so that a full continuum of services is provided for students (Flaherty et al., 1998; Waxman, Weist, & Benson, 1999). Expanded SMH aims to build on the mental health services already provided by school-employed staff, such as teachers, nurses, school psychologists, counselors and social workers. This collaboration and creation of a continuum of services in the school helps to create a coordinated system of care in a naturalistic setting.

Further, federal agencies have emphasized the importance and enhancement of school climate in fostering positive social and emotional outcomes for youth (Office of Safe and Drug Free Schools, 2007). In addition, the President's New Freedom Commission on Mental Health (2003), the Surgeon General's report on Mental Health (United States Department of Health and Human Services, 1999) and the No Child Left Behind Act (2002), all call for the expansion of mental health services for youth in schools. More recently, in response to tragic school violence, President Obama put forth a plan to create safer schools and increase access to mental health services for youth through funding for activities such as mental health training for teachers, improving screening for mental health problems and subsequent referral to intervention, employing

additional mental health professionals in schools and for school-based prevention and intervention programs (The White House, 2013).

A major benefit of SMH services is increased access to mental health services for youth and families (Atkins et al., 2006; Catron, Harris & Weiss, 1998). Schools allow feasible access to youth given compulsory schooling. For example, when considering geographic access there is no additional drive time for youth to receive mental health services in school, since schooling is compulsory. Additionally, schools are a community location that may be more accessible to families than traditional community mental health services. Indeed, schools have been identified as one of the most frequently used mental health services sectors (Burns et al., 1995; Merikangas et al., 2011; Rones & Hoagwood, 2000). Nationally, it is estimated that approximately 20% of students receive some form of SMH services (Foster, Rollefson, Doksum, Noonan, Robinson, & Teich, 2005). Further, families are more likely to follow through on a referral to SMH services than CMHC services. Upwards of 80% of school referred families begin services while only 4 - 13% of the community-based referred youth and families begin treatment (Atkins et al., 2006; Catron, Harris & Weiss, 1998). These findings may be related to families finding SMH services less stigmatizing (Kataoka et al., 2003).

Moreover, evidence suggests that SMH increases access to mental health services for especially high risk youth and families. As previously mentioned, minority and disadvantaged youth are less likely to receive mental health care (Angold, Erkanli, & Farmer, 2002; Kataoka, Zhang & Wells, 2002; Merikangas et al., 2011; Witt, Kasper & Riley, 2003), however, SMH may be helping to close this service gap. In a rural sample of youth, indeed, African American youth were less likely to receive specialty mental

health services when compared with white youth, however, there was no disparity in receipt of SMH services (Angold et al., 2002). That is, African American and white youth were equally likely to receive SMH treatment. Similarly, in a sample of predominately low-income, Hispanic youth, youth were over 20 times more likely to receive services in the school than the community (Juszczak, Melinkovich & Kaplan, 2003). In a study of inner city youth using community versus SMH services, youth utilizing school services were more racially diverse and socioeconomically disadvantaged (Armbruster, Gerstein & Fallon, 1997).

These studies point to the promise of SMH in bridging the gap between service need and service utilization for youth that are less likely to receive needed mental health services. And, as the country becomes increasingly diverse, schools must be proactively responding to shifting demographics (Clauss-Ehlers, Weist, Gregory, & Hull, 2010). However, these studies focus on the individual-level characteristics linked to service utilization and pay little to no attention to the community and geographic correlates of SMH versus CMHC service utilization. Thus, this will be an important next step to expanding the literature on access of children and youth to mental health services and ways to improve this access.

### **Current Study**

The purpose of the current study was to expand on existing research by examining community-level and geographic predictors of the utilization of SMH or CMHC services. Within the context of a large, federally funded trial, I examined community-level and geographic variables that predicted the use of either SMH or CMHC services. Community factors included median household income, rurality (i.e., population density),

and race/ethnicity of the community. Geographic accessibility was the geographic predictor, as measured by drive time to the CMHC. As has been discussed, there have been studies that investigate self-reported barriers to youth mental health treatment, but none that have looked at drive time to various types of youth mental health facilities. Thus, it seems that this is a logical next step in this line of empirical investigation.

Given the extant literature highlighted above, it was predicted that youth and families in predominately minority and/ or rural communities would be more likely to use SMH services than CMHC services. Additionally, it was predicted that individuals living farther away from the CMHC would be more likely to utilize SMH services, as schools are more centrally located in local communities, suggesting that SMH services are more geographically accessible than traditional CMHC services.

To investigate these relationships, I utilized a geographic information system (GIS), a research methodology that is novel in the field of SMH research. As presented earlier, a geographical information system (GIS) enables the organization, analysis and display of geographically referenced information. Despite the potential applications of GIS to understanding SMH research, no research has attempted to use GIS to evaluate accessibility and community level factors that may relate to the utilization of SMH services.

## CHAPTER 2

### METHOD

The data for this study were collected through a large, randomized controlled trial funded by the National Institute of Mental Health (R01MH0819141; PI, M. Weist) which aimed to test a framework for improving the quality of school mental health services.

#### **Participants**

Participants in the broader study included school mental health clinicians employed by a community mental health center and based in elementary, middle, and high schools as well as the students and families served by the clinicians. Data for the current paper are from a subsample of the broader project and includes youth receiving either SMH or CMHC ( $n = 168$ ). Families were recruited to participate in the broader project if they were on the caseload of a participating SMH clinician and had a disruptive behavior problem. The comparison sample for the current sub-study was matched on presenting a disruptive behavior problem. The disruptive behavior problem criteria did not necessitate a specific diagnosis, rather, the child had to have one presenting problem related to disruptive behavior. This was assessed by a trained post-doctoral fellow that reviewed treatment intake files. All participants were school-aged (i.e., 4-18 years) and from the southeastern United States. No other demographic information can be presented, as it was not collected in the sub-study. Rather participants' demographic information was captured at the block group level.

## **Measures**

**Community variables.** Community level variables were captured at the block group level through the 2010 United States Census and the 2007-2011 American Community Survey 5-year estimates. The United States Census Bureau (2012) defines a block group as a statistical division of census tracts that contain between 600 and 3,000 people. Most BGs were demarcated by local participants and never cross state, county, or census tract boundaries. Rurality, race and ethnicity variables were all collected through the 2010 census. Rurality was captured through a measure of population density, or the average number of people per square mile. This is calculated by dividing the number of people in a specified block group by its land area in square miles (United States Census Bureau, 2012). Lower values on this variable indicate lower population density and more rurality while higher values indicate higher population density or more metropolitan-like. The race/ethnicity variable that is included represents the percent of non-white individuals living in a designated block group. That is, this variable includes the percent of the total block group population that indicated a racial or ethnic category other than White/Caucasian. Higher values indicate a higher proportion of minorities living in the block group. Median household income was collected through the American Community Survey and the data used represent data collected from 2007-2011. Median household income includes the income of the householder and all other individuals 15 years old and over in the home at the time of the interview. While originally collected from individual participants, these data were then aggregated at the block group level.

**Drive time to the CMHC.** Drive time from a participant's home address to the closest community mental health center was calculated using Network Analyst in ArcGIS

version 9 (Environmental Systems Research Institute, 2011). Drive time is the shortest road route between a student's home address and the nearest CMHC when considering average speed.

**Mental health services utilization.** All participants in the project utilized SMH or CMHC services. This variable served as a dichotomous outcome measure on whether the youth and family used SMH or CMHC services.

### **Procedure**

Families were contacted via mail and contacted via phone to be notified that they would receive the opportunity to participate in this project through the mail. Interested parents completed the consent form and mailed it back to research staff. Upon this receipt, all parents were compensated with a gift card for their participation in the project. In addition, study procedures were approved and monitored by the South Carolina Department of Mental Health Institutional Review Board as well as secondarily by the University of South Carolina Institutional Review Board.

Mailings were sent to 699 potential participants. Of these, 488 received SMH services and were included in the broader project and 211 had received outpatient services at a CMHC. The response rate overall was about 24% of the targeted sample (i.e., 25.82% for participants in the broader project and 19.91% for the CMHC target sample).

### **Analytic Plan**

All consented participants' addresses and addresses of the CMHCs were geocoded using Environmental Systems Research Institute Geographic Information System software, ArcGIS v.10 (Environmental Systems Research Institute, 2011). Travel

times were estimated by ArcGIS using Network Analyst and conducting a Nearest Facility Analysis. Through this process, ArcGIS calculated the shortest road route between the home address and the nearest CMHC when considering average speed. To gather relevant socio-cultural variables, a layer was added in ArcGIS that defined block group geographic areas. By joining this layer with geocoded participant addresses, each participant's block group was determined and allowed merging with relevant Census and American Community Survey data to acquire race/ethnicity, median household income, and rurality for participants. All data generated through the GIS was uploaded into IBM SPSS Statistics, Version 22.

It should be noted that 15 participants had missing data on relevant predictor variables. These cases were list-wise deleted, resulting in an overall sample of 153 youth for analyses. Community variables (i.e., race/ethnicity and rurality), drive time to the CMHC, and control variables, the county of residence and median family income, were entered into a simultaneous logistic regression as predictors of the probability of families utilizing SMH or CMHC services in IBM SPSS Statistics, Version 22. A  $p$ -value of 0.05 (two-tailed) was adopted for analyses and assumptions for logistic regression were met.

## CHAPTER 3

### RESULTS

#### **Descriptive Statistics**

Seventy-five percent ( $n = 114$ ) of 153 participants in this study received SMH services. Participants lived in one of 4 counties and 86.3% of the sample lived in one of the counties. Similarly, participants lived in one of 17 Census block groups. The number of individuals living in each block group ranged from 1-50 with 61.5% of the sample living in the two most frequently identified block groups. See Table 1 for an overview of the descriptive statistics for predictor variables, including means and standard deviations.

Further, when examining the descriptive statistics, approximately 34% of sample was over 30 minutes of drive time to the CMHC. Of these individuals that were not within the geographically accessible region to CMHC services, 75% utilized SMH services.

#### **Correlations**

Correlations were examined among the study variables and indicated that none of the predictor variables were significantly correlated with the outcome variable (see Table 2). That is, the covariates, county of residence and median family income at the block group level, nor the predictors of interest, population density and percent of minorities living at the block group level as well as drive time to the CMHC, were not significantly correlated with the receipt of SMH or CMHC services. Although the associations were

not significant, the relationships between the receipt of SMH services and minority makeup of the block group and drive time to the CMHC were in the hypothesized direction. As the minority makeup of a block group increased, so did the chance of utilizing SMH in contrast to CMHC services. Similarly, as hypothesized, as drive time increased, so did the chance of utilizing SMH services. Again, although the relationship was not significant, the association between population density and receipt of services was opposite of the relationship hypothesized. Indeed, as population density decreased, or became more rural, the chance of using SMH decreased as well. However, all of these relationships between variables were very small and did not meet the significance requirement of  $p < .05$ .

Correlations among the predictor variables indicated that county of residence is significantly associated with drive time to the CMHC, percent of minorities and median family income. Population density was significantly associated with minority makeup of the block group as well as median family income. As population density of a block group increased, so did the percentage of minorities living in a block group  $r(153) = .57, p < .05$ . When considering median family income, as population density increased, median family income decreased  $r(153) = -.44, p < .05$ . And finally, as the percentage of minorities living in a block group increased, the median family income decreased  $r(153) = -.76, p < .05$ .

### **Logistic Regression**

A logistic regression was conducted to assess whether rurality, race/ethnicity, median household income, drive time to the CMHC and nearest CMHC significantly predicted whether a participant received SMH or CMHC services (see Table 3). When

these predictors were considered, they produced a model that did not significantly predict whether a participant received SMH or CMHC services,  $\chi^2= 10.30$ ,  $df= 7$ ,  $N= 153$ ,  $p = .17$ . This model predicted 74.5% of the responses accurately. None of the predictors were significant to the best fit equation.

Table 3.1

*Means and Standard Deviations of Continuous Predictors and Covariates*

Predictor	<i>M</i>	<i>SD</i>
Population Density (BG)	1220.02	610.66
Drive Time to CMHC	24.76	12.80
Percent of Minorities (BG)	52.09	24.62
Median Family Income (BG)	42254.06	17025.77

*Note.* BG = Block group level. *M* = mean. *SD* = Standard deviation.

Table 3.2

*Correlations among the Outcome Variable, Predictors and Covariates*

Variable	1	2	3	4	5	6
1. Receipt of SMH services	---					
2. County of Residence	.03	---				
3. Population Density (BG)	.02	-.02	---			
4. Drive Time to CMHC	.03	.20**	-.08	---		
5. Percent Minority (BG)	.09	.35**	.57**	-.11	---	
6. Median Family Income (BG)	-.08	-.36**	-.44**	.03	-.76**	---

*Note.* BG = Block group level. \*\* = significant at the  $p < .05$  level.

Table 3.3

*Binary Logistic Regression Predicting Use of SMH Services*

Predictor	$\beta$	SE $\beta$	Wald's $\chi^2$	<i>df</i>	<i>P</i>	Odds Ratio
Constant	20.59	15145.66	0.00	1	.99	874311151.10
Drive Time to CMHC	.02	.02	.90	1	.34	1.02
Percent Minority (BG)	.01	.01	.23	1	.63	1.01
Median Family Income (BG)	.00	.00	.29	1	.59	1.00
Population Density	.00	.00	.49	1	.48	1.00
County of Residence			2.30	3	.51	
Test			$\chi^2$	<i>df</i>	<i>p</i>	
Overall Model Evaluation						
			Likelihood Ratio Test	10.30	7	.17

## CHAPTER 4

### DISCUSSION

The aim of this paper was to expand the existing literature by examining community-level and geographic predictors of the utilization of SMH or CMHC services. It was hypothesized that youth and families in predominately minority and/ or rural communities will be more likely to use SMH services than CMHC services. Additionally, it was predicted that individuals living farther away from the CMHC would be more likely to utilize SMH services, suggesting that SMH services are more geographically accessible than traditional CMHC services. Given the results highlighted above, these hypotheses were not supported in the current analyses, although, some interesting patterns emerged and are further discussed.

Service utilization at schools versus the community mental health center was not predicted by the community- or geographic-level predictors examined in the current study. However some interesting descriptive findings did emerge. When examining the descriptive statistics, approximately 34% of sample was over 30 minutes of drive time to the CMHC. As 30 minutes has been recommended as the time-to-service standard (Arkansas Center for Health Improvement, 2013; Jacoby, 1991; McCarty & Farris, 2013), this suggests that over 30% of the sample does not have geographically accessible CMHC services. Of these individuals that were not within the geographically accessible region to CMHC services, 75% utilized SMH services. This may lend preliminary

support to the notion that SMH services help improve geographic accessibility for those youth that live furthest from the CMHC.

### **Limitations**

This research presents some limitations. First, the study was limited by the sample obtained for this study. A small percentage of participants received CMHC services; that is, only 25% of the sample or 39 of 153 participants received CMHC services whereas the majority received SMH services. It is unlikely that this small sample represents the population of youth receiving CMHC services. Further, given the data collection procedures through the mail, there may be a self-selection bias in this sub-study sample. In addition, data were nested within counties and block groups. Ninety-five percent of the sample lived in one of the counties. Similarly, 61.5% of the sample lived in the two most frequently identified block groups. As some of the predictor variables were measured at the block group level (i.e., rurality, percent of minorities and median income) this likely reduced variability in the model such that many of the participants had the same value for community-level predictors.

Further, this research did not account for other mental health services in the region. All participants in this study received state department of mental health services in the CMHC or the school, therefore, these were the services that were the focal point of this research. However, the CMHC may not have been the most accessible mental health services for participants.

There are also alternative methods for measuring drive time to mental health facilities. For example, for CMHC utilizers, drive time could have been calculated from home to the CMHC while drive time for SMH utilizers could have been calculated from

home to the school. However, given compulsory schooling, it was assumed that youth had access to services at schools. Therefore, the aim of this paper was to explore SMH services increased access over and above traditional CMHC services, as they are a more naturalistic setting that has been identified as one of the most frequently used mental health services sectors (Burns et al., 1995; Merikangas et al., 2011; Rones & Hoagwood, 2000). Further, little is known about the location of school mental health services in reference to community mental health services. For example, it may important to consider the reduced drive time in receiving SMH services versus CMHC services, warranting additional research related to improved access of services.

And a final limitation of this project is that it focused on access on receipt of services alone. While this is an important first step to the receipt of services, there are also many other components critical to the receipt of mental health services. Broadly, youth should have access to quality, evidence-based mental health treatment. In addition, youth should attend services beyond the first session and be engaged behaviorally and attitudinally in the treatment process (Staudt, 2007). Thus, future research could address a broader array of these factors involved in the receipt of effective mental health services.

### **Conclusions and Future Directions**

As has been highlighted in the literature review above, research has shown that SMH services increase access for all, especially those particularly at risk for not receiving services (Angold et al., 2002; Juszczak, Melinkovich & Kaplan, 2003; Armbruster, Gerstein & Fallon, 1997).). No research up to this point has examined the broader community variables and geographic (in this case, drive time) variables that could assist with selection of locations to place the most critical SMH services. Although SMH can

be valuable in all schools given its known benefits (for review see Center for School Mental Health, 2013), limited resources may require allocation of said resources in certain communities. With a better understanding of community factors that impact the utilization of certain types of mental health services, effective allocation of resources could be maximized. In addition, this research has incorporated the use of a GIS. Geospatial data is widely available and is critically important to health services research (Richardson et al., 2013). However, while GIS has been used to answer a variety of multidisciplinary and complex research questions, it's use is novel in answering questions related to access to SMH services.

In future research, community and geographic factors should continue to be explored in relation to the use of SMH services. For example, for youth utilizing SMH services, drive time could be calculated for both their home to CMHC and home to school to evaluate if the school services are more geographically accessible. Similarly, future research should utilize larger sample of individuals living across more block groups to increase variability in the model. It is believed that future research that incorporates innovative strategies, such as these, will lead to a better understanding of community and geographic factors related to youth mental health services utilization.

As has been highlighted in the literature review, various factors, such as geographic and demographic variables, impact access to mental health services. Globally the discrepancy between mental health needs and access to mental health services is being recognized (World Health Organization, 2008). Various work groups have been created to move forward initiatives related to increasing access to mental healthcare, such as The International Consortium on Mental Health Policy and Services (Gulbinat et al.,

2004). This particular consortium aims to “to generate guidelines and examples for upgrading mental health policy with due regard to the existing mental health delivery system and demographic, cultural and economic factors” (Gulbinat et al., 2004, p. 9). In examining the landscape of how national mental health systems are organized and financed, it seems that demographic and cultural factors interact to produce differing rates of access to needed mental health services. As these, and other related initiatives move forward, it will be critical to understand how community factors impact access to mental health services towards creating systems that promote access for all.

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