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THE ECOLOGY OF MENTAL HEALTH AND THE IMPACT OF BARRIERS ON MENTAL HEALTH SERVICE UTILIZATION

By

Alisha Aggarwal, MD

A DISSERTATION

Presented to the Faculty of
the University of Nebraska Graduate College
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy

Health Services Research, Administration, & Policy
Graduate Program

Under the Supervision of Professor Hyo Jung Tak

University of Nebraska Medical Center
Omaha, Nebraska

July 2021

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Dedicated to

My mother, Dr. Saroj Aggarwal

And my father, Dr. Pradeep Aggarwal

ACKNOWLEDGEMENTS

Reflecting at the end of this journey, I would like to acknowledge with gratitude, all the people who have encouraged and supported me in making this path a successful and satisfying one. First and foremost, I thank The Almighty for his countless blessings. I fall short of words to express my gratitude for my dissertation committee chair, Dr. Hyo Jung Tak who inspired me in more than one way. She has been the most approachable member of our department, a wonderful teacher, and helped me hone my analytical skills for diverse types of datasets. She motivated me to be more ambitious and played a vital role in my dissertation-related achievements and learning the STATA software package. A mere thanks would be insufficient for Dr. Li-Wu Chen who provided me unwavering support and encouragement since the first day of the doctoral journey. I am also thankful to my dissertation committee members, Dr. Fernando Wilson, Dr. David Cates, and Dr. Hongmei Wang for their guidance and constructive feedback which was very crucial in the completion of my dissertation. I would like to mention a special thanks to Dr. Jungyoon Kim, for I have learned a great deal working with her on multiple research projects. I would like to acknowledge the overwhelming support extended to me by all the other faculty members of our department. I would also like to thank the technical staff of our college for their assistance every time I needed it.

I am thankful to my friend, Sachi Verma, who has been a constant source of encouragement and support and her master plans have helped me deliver on deadlines. I am grateful for her cats: Zoey and Simba, who have been my stressbusters every day for three years. I want to thank Dr. Bedant Chakraborty for his friendship and support. We embarked on this journey together and have learned a great deal from each other. Life in Omaha would not have been the same without them.

I would like to extend the most heartfelt gratitude to my parents, Dr. Saroj Aggarwal and Dr. Pradeep Aggarwal, as without their support, none of this would have been possible. I am truly grateful to them for believing in me and giving me the opportunities to pursue my dreams. I could not have achieved anything without them. I would like to thank my sister, Dr. Anisha Aggarwal, and my brother, Prayaas Aggarwal, for their selfless love and for being my constant source of confidence in uncertain times. I owe my sanity to them and our cats: Muffin, Sophie, and Claude. Finally, I would like to thank the newest member of my family, my husband, Kamal Tayal, for his unconditional love and support. He was very patient, encouraging, and supportive of everything as I spent months working on this dissertation after our wedding. He helped me move forward with a positive mind through the pandemic and it could not have been a smoother ride without him. Thank you for everything you do for me!

I owe this to all of you.

Thank you!

THE ECOLOGY OF MENTAL HEALTH AND THE IMPACT OF BARRIERS ON MENTAL HEALTH SERVICE UTILIZATION

Alisha Aggarwal, MD, PhD

University of Nebraska, 2021

ABSTRACT

Supervisor: Hyo Jung Tak, PhD

Mental health has emerged as a major public health concern in recent times with several disparities and barriers related to adequate health service utilization. Different age groups experience diverse symptoms and face distinct barriers in accessing and utilizing healthcare. Policies like Mental Health Parity and Addiction Equity Act and the Patient Protection and Affordable Care Act were launched to improve insurance coverage and delivery of mental health services. However, a large gap of unmet needs exists for adequate mental health service utilization in the country. This dissertation aims to describe the financial and non-financial barriers to mental health service utilization and academic outcomes among the pediatric age group, disparities in mental health service utilization among the geriatric population, and the ecology of mental health and its impact on overall health outcomes among adolescents.

The goal of this dissertation is to provide the most recent and updated results to fill the information gap and thereby guide physicians, healthcare systems, and policymakers to initiate and implement changes to improve access and utilization of mental health services. Data from the National Survey of Children's Health, 2016-2018, and the National Health and Nutrition Examination Survey, 2015-2018, were used for this dissertation with respective study populations identified based on age groups and a diagnosis of mental health condition. The data were weighted to produce individual-level

nationally representative results. We used Anderson's Health Care Utilization Model and Social-Ecological Model to derive the conceptual framework of this dissertation.

The dissertation underlines that spreading awareness and reducing stigma could potentially impact behavioral patterns towards seeking mental healthcare. Training healthcare providers to offer culturally sensitive patient-centered care and services will help mitigate disparities among distinct population groups. Mental health support should be incorporated in transition plans to adult health care to ensure appropriate healthcare delivery. Home environment and social structure play a vital role in shaping physical and mental health outcomes among adolescents. More holistic strategies and policies are needed to improve mental health service utilization and outcomes.

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LIST OF ABBREVIATIONS

AAP	American Academy of Pediatrics
ACASI	Audio computer-assisted personal self-interview
ACE	Adverse Childhood Experience
ADD	Attention Deficit Disorder
ADHD	Attention Deficit Hyperactivity Disorder
AI	American Indian
AME	Average Marginal Effects
AN	Alaskan Native
APA	American Psychiatric Association
ASD	Autism Spectrum Disorder
BMI	Body Mass Index
CAPI	Computer Assisted Personal Interview
CDC	Centers for Disease Control and Prevention
CHIP	Children’s Health Insurance Program
CI	Confidence Interval
DALY	Disability Adjusted Life Years
DHHS	Department of Health and Human Services
DiD	Difference in difference
DSM	Diagnostic and Statistical Manual

ER	Emergency Room
ERB	Ethics Review Board
FSA	Flexible Spending Accounts
GAD	Generalized Anxiety Disorder
GIS	Geographic Information System
HMO	Health Maintenance Organization
HRSA	Health Resources and Services Administration
HSA	Health Savings Accounts
IRB	Institutional Review Board
MCHB	Maternal and Child Health Bureau
MEC	Mobile Examination Center
MHPAEA	Mental Health Parity Addiction and Equity Act
NAMI	National Alliance on Mental Illness
NCHS	National Center for Health Statistics
NH	Native Hawaiian
NHANES	National Health and Nutrition Examination Survey
NHIS	National Health Interview Survey
NSCH	National Survey of Children’s Health
OR	Odds Ratio
PI	Pacific Islander

PP-ACA	Patient Protection and Affordable Care Act
SAMHSA	Substance Abuse and Mental Health Services Administration
SCHIP	State Children's Health Insurance Program
SHCN	Special Health Care Needs
UN	United Nations
UNMC	University of Nebraska Medical Center
US	United States
WHO	World Health Organization

CHAPTER 1: BACKGROUND

MENTAL HEALTH

Mental health is described as emotional, psychological, and social well-being. Mental illness is a group of diagnosable mental disorders characterized by sustained, abnormal alterations in thinking, mood, or behavior associated with distress and impaired functioning (US DHHS, 1999). The American Psychiatric Association (APA) (2015) defined mental illness as a condition involving changes in thinking, emotion, behavior, or their combination. Mental illnesses have a high prevalence in the United States (US) affecting nearly one in five adults in 2019 (51.5 million adults or 20.6% of all adults in the US) (National Institute of Mental health, 2020). Poor mental health impacts daily functioning and results in reduced productivity, unhealthy relationships, and the inability to adapt to changes and cope with adversity. Mental illness can affect anyone irrespective of age, gender, race/ethnicity, socio-economic status, or culture, etc.

Among children, mental health disorders are described as serious changes in the manner of learning, behaving, or handling emotions, which often leads to distress and problems for both the child and the parent (CDC, 2020c; Perou et al., 2013). Some of the commonly prevalent mental health disorders that can be diagnosed during childhood include attention deficit hyperactivity disorder (ADHD), anxiety, and neurodevelopmental disorders such as Autism. ADHD (formerly known as attention deficit disorder [ADD]) is generally characterized by difficulty in focusing on a single task and having a tendency for hyperactive and impulsive behaviors (Psychology charts, n.d.). However, some children are either predominantly inattentive or predominantly hyperactive-impulsive.

Autism is generally described as impaired social development, diminished communication skills, and restrictive or repetitive behavior. Autistic behavior is highly variable and is often described in terms of autism spectrum disorder (ASD) rather than

distinct categories. 9.4% of children aged 2-17 years (approximately 6.1 million) have received an ADHD diagnosis (Danielson et al., 2018). 7.4% of children aged 3-17 years (approximately 4.5 million) have a diagnosed behavior problem (Ghandour et al., 2019). For children aged 3-17 years with behavior problems, more than 1 in 3 have anxiety (36.6%) and about 1 in 5 have depression (20.3%) (Ghandour et al., 2019). 3.2 million adolescents aged 12 to 17 in the US had at least one major depressive episode (13.3% of the US population aged 12 to 17) (National Institute of Mental health, 2019).

Depression has emerged as a major public health concern in recent times with more than 264 million people living with the illness globally (James et al., 2018). Depression is different from regular mood fluctuations and momentary emotional responses to challenges in day-to-day life. Chronic depression may become a serious health condition and can cause great suffering to an individual resulting in poor performance at work, school, and in the family. A dangerous consequence of depression is suicide which is the second leading cause of death in 15- to 29-year-olds (WHO, 2020a). An estimated 17.3 million adults (7.1% of all US adults) in the US above the age of 18 years had at least one major depressive episode in 2017 (National Institute of Mental health, 2019).

Generalized Anxiety Disorder (GAD) is characterized by excessive worry that is difficult to control accompanied by physical symptoms such as restlessness, being easily fatigued, difficulty concentrating, irritability, muscle tension, or sleep disturbance (American Psychiatric Association, 2013). More than 15% of adults in the US experienced symptoms of anxiety in 2019 (Terlizzi & Villarroel, 2020).

Over the last three decades, a significantly large literature on the epidemiology of late-life mental health points out that late-life depression has a high prevalence in

primary care and long-term care settings (Beekman et al., 1995; Gurland, Cross, & Katz, 1996; Lebowitz et al., 1997). It has been associated with reduced functioning (Alexopoulos et al., 1996) and quality of life (Unützer et al., 2000), poor outcomes of comorbid conditions, increased health care costs (Unützer et al., 1997), and increased mortality (Murphy, Smith, Lindesay, & Slattery, 1988; Penninx et al., 1999). In comparison to younger adults, most older adults with mental health disorders experience consequential medical comorbidities such as cardiovascular diseases, diabetes, hypertension, arthritis, chronic pain, etc. (Katz, 1996; Miller et al., 1996). However, very little is known about the diagnosis, prognosis, and impact of depression in the face of comorbid illnesses (Cole, Bellavance, & Mansour, 1999). Furthermore, relatively little is known about the interactions between mental health and comorbid conditions and the clinical and public health significance of the reasons for mental illnesses that are specific to old age.

The consequences of poor mental health are not limited to patients and their immediate social environment, but rather affect the entire social fabric, especially through economic costs. Moreover, studies on economic costs present contradictory findings due to the scarcity of standard definitions of disorders, sample study populations, source of costs and service utilization, analytical framework, and incomplete cost categories due to lack of data (Hu, 2004). The economic cost of mental illness in the US is significant and approximates $300 billion (CDC, 2011). The World Health Organization (WHO) reported that globally, mental illnesses are the leading cause of Disability-Adjusted Life Years (DALY) and account for 37% of healthy years lost to non-communicable diseases at an approximate cost of $2.5 trillion (Pal, 2015).

LITERATURE

The National Survey on Drug Use and Health (NSDUH) defines mental health treatment as having received inpatient treatment, counseling, outpatient treatment, or having used prescription medication for problems with emotions, nerves, or mental health (McCance-Katz, 2019). Sixty-four percent of people with serious mental illness received treatment in the year 2016 (National Institute of Mental health, 2020). Understanding health service utilization has surfaced as a vital determinant for tailoring services based on public needs. Knowledge about sources, determinants and barriers of health service utilization can help with disease treatment and prevention, inform healthcare institutions to better target customers for medical help, and prepare healthcare organizations for the estimated growth of diverse populations. However, past literature has shown that mental health services have been routinely and consistently underutilized.

Epidemiological studies reveal that only a minority of individuals suffering from mental health disorders use mental health care services (Kessler et al., 1999; Kessler et al., 2003; Mojtabai, Olfson, & Mechanic, 2002; Vasiliadis, Lesage, Adair, & Boyer, 2005; Wang, Berglund et al., 2005; Wang, Lane et al., 2005). Approximately 60.1% of adolescents with major depressive episodes did not receive treatment (National Institute of Mental health, 2019) and more than 50% of adults in the US with mental illness did not receive treatment in 2019 (National Alliance on Mental Illness, 2020).

Mental health conditions are treatable and preventable (American Psychiatric Association, 2015); however, there is scant literature to compare the frequency of visits and the type of professionals consulted with regards to several mental disorders (Meadows et al., 1997; Wang et al., 2006). Some studies highlighted the key

determinants of healthcare service utilization along with several barriers that have resulted in constant under- or non-utilization of such services. These barriers could be related to cultural beliefs, racial discrimination, social stigma, access, affordability, etc.

The research identified structural issues, such as service cost or lack of insurance coverage, as the most frequent barriers to treatment-seeking (SAMHSA, 2015b). Some studies suggest that rural residents may have a lower risk of recurrent mental distress than urban residents (Probst et al., 2006; Rohrer, Borders, & Blanton, 2005). Some other studies also provide evidence that there are considerable unmet needs for mental health services in most rural areas, especially among male counterparts (Chou & Cheung, 2013; Gfroerer, Larson, & Colliver, 2007). Results from a study showed lower rates of utilization of specialty mental health services, including psychiatrists, psychologists, counselors, and social workers in rural areas compared to urban areas (Deen, Bridges, McGahan, & Andrews III, 2012). Similarly, another researcher estimated that mental health related spend was lower among rural residents than those living in urban areas (Ziller, Anderson, & Coburn, 2010). Researchers have attributed this finding to the lower cost of psychotherapy in rural versus urban areas.

The high rate of being uninsured among people with mental illness also contributes to the high medical cost which acts as a barrier to treatment (Ziller et al., 2010). Around 20% of people with mental disorders are uninsured compared to 15% in the US (DeNavas-Walt, Proctor, & Smith, 2013; Rowan, McAlpine, & Blewett, 2013). 11% of US adults with mental illness had no insurance coverage in 2019 and 60% of US counties did not have a single practicing psychiatrist (National Alliance on Mental Illness, 2020).

BARRIERS

The WHO (2001) mentions that “the single most important barrier to overcome in the community is the stigma and associated discrimination towards persons suffering from mental and behavioral disorders”. As attitudes toward help-seeking have become increasingly negative in the past 40 years, stigma has gathered more attention (Corrigan, Patrick, 2004; Mackenzie, Erickson, Deane, & Wright, 2014). Culture influences people’s values, attitudes, and beliefs, and plays a vital role in changing the perception of self and others around them. It also determines how people live and work in their social environment.

Race, ethnicity, dietary preference, alcohol/drug use, health beliefs/values, religion, rituals, and socioeconomic status, etc., play a key role in determining the intensity of stress and the presentation of emotional problems. Some cultures have a belief that good mental health can be achieved through willpower and by avoiding bad thoughts (Stewart, 1995). Fear of stigmatization is commonly thought to be an important reason for not seeking mental health treatment (Chen, S. X. & Mak, 2008). People from diverse cultures and backgrounds express mental health conditions differently, for example, some are more likely to visit a healthcare provider with complaints of physical symptoms that are perceived to be caused by a mental health condition.

The stigma around mental illness and treatment prevents many people from seeking needed treatment. The high prevalence of diagnoses of mental illnesses among people with chronic medical conditions raises the need for healthcare administrators and policymakers to aid in the integration of care for both physical and mental health (Goodell, Druss, Walker, & Mat, 2011). Statistics have shown that treating comorbid conditions is expensive, for example, about 80% of the annual increased costs are due to non-behavioral medical services for comorbid psychological disorders in the US

(Melek & Norris, 2011). Also, the average total monthly spending for a person with a chronic disease and a diagnosis of depression is $560 more than for a person without depression (Melek & Norris, 2011). Bipolar disorders are associated with higher utilization and costs of health services due to comorbidities (Rajagopalan et al., 2006).

In the US, significant disparities in mental health service utilization have been documented between native and foreign-born individuals (Abe-Kim et al., 2007; Jackson et al., 2007; Kung, 2003). In addition to the barriers to the use of mental health services faced by non-citizens, such as unfamiliarity with the US health care system and limited English proficiency, these individuals are more likely to face greater financial difficulty accessing mental health services when compared to naturalized or US-born counterparts (Moon, Lubben, & Villa, 1998). Racial/ethnic disparities in physical and mental health status have received increasing attention as well.

UNMET NEEDS

Well documented gaps in health status are believed to reflect, among other factors, underlying differences in access to care. In the mental health domain, researchers have repeatedly demonstrated differences in rates and patterns of mental health treatment for African Americans, Latinos, and Asian Americans (Cheung & Snowden, 1990; Neighbors et al., 1992; Scheffler & Miller, 1991). The Surgeon General's report on mental health noted that the needs of minority racial/ethnic groups remain largely unmet. Among minority persons who have received mental health treatment, premature cessation of health services has been especially problematic (Neighbors et al., 1992; US DHHS, 1999). The literature has been inconsistent in its treatment of disparities accounted for by socioeconomic factors. Though the effects of race/ethnicity have been estimated for socioeconomic variables (Alegría et al., 2002;

Fiscella, Franks, Doescher, & Saver, 2002), the literature lacks results from analytical models after adjusting for socioeconomic variables (Wang et al., 2005; Wells, Klap, Koike, & Sherbourne, 2001).

Although studies on the causes of mental health tend to emphasize social characteristics measured at the level of the individual such as socio-economic status, research also suggests that mental health may vary according to social characteristics measured at the level of the neighborhood (Franzini et al., 2009; Singh, G. K., Kogan, Van Dyck, & Siahpush, 2008; Singh, G. K., Siahpush, & Kogan, 2010). Social environments including home, school, workplace, etc., can significantly impact the behavior and health of a person. An increasing focus on health inequalities and the social determinants of health has also highlighted the potentially powerful role of neighborhood and community context in influencing adolescent health and development (Vlahov et al., 2007).

The striking trends in urbanization across the globe and the enormous growth of urban slum settlements make it imperative for us to better understand the extent to which neighborhoods, and the specific factors within the neighborhood, influence the health of adolescents (Marmot et al., 2008). The recent spike in studies linking neighborhood environments and population health has focused mainly on physical health, with relatively few focusing on mental health (Miles, Coutts, & Mohamadi, 2012). To date, however, we have limited understanding of how factors within this context operate and affect the health and well-being of adolescents living in diverse backgrounds around the globe.

POLICY REFORMS

Several policy reforms have been initiated in the last two decades to improve the access and availability of adequate mental health services for all. In 2002, President Bush launched the President's New Freedom Commission on Mental Health to endorse policies for adoption by federal, state, and local governments to improve mental health services (Hogan, 2003; Leong & Kalibatseva, 2011). The commission focused on six goals to transform the mental health system (i) accepting that mental health is essential to overall health (ii) offering family-driven mental health care (iii) eliminating disparities (iv) focusing interventions for early detection, assessment, and treatment (v) implementing evidence-based research into practice, and (vi) using technology while providing care and access to information. Furthermore, the federal government established a system to make calls to expand workforce research and development initiatives to improve mental health delivery.

In 2008, the Paul Wellstone and Pete Domenici Mental Health Parity and Addiction Equity Act (MHPAEA) required most Medicaid and Children's Health Insurance Programs (CHIP) to apply the same rules to coverage for mental health and substance use disorder services as for coverage for physical health services (Centers for Medicare & Medicaid Services, 2010). With this implementation, the health insurers and group health plans were required to provide the same level of benefits for mental and/or substance use treatment services that they do for medical or surgical care. The parity was expected to expand coverage for mental health and substance use disorder services and restructure the use of cost and quality management to provide behavioral health benefits (Dixon, K., 2009; Shern, Beronio, & Harbin, 2009). Particularly, the federal parity requirements impacted the coverage available under the CHIP which was a publicly financed insurance for children in families with more earning than needed to

qualify for Medicaid but without adequate income or alternative access to health insurance (Centers for Medicare & Medicaid Services, 2016). The CHIP Reauthorization Act of 2009 required state CHIP programs to comply with the 2008 federal parity law (Centers for Medicare & Medicaid Services, 2010).

More recently, President Obama launched the Patient Protection and Affordable Care Act (PP-ACA), intending to finance and improve the delivery of mental health and addiction care (Barry, C. L. & Huskamp, 2011). The ACA demanded parity in coverage, thereby making behavioral healthcare equivalent to other medical and surgical benefits. Also, the ACA's implementation aimed to improve access problems and system fragmentation that would assist people suffering from mental health disorders (Barry, C. L. & Huskamp, 2011; Leong & Kalibatseva, 2011). The ACA in conjunction with the MHPAEA, intended to reduce the number of uninsured people and improve access to mental health services.

Despite all the socio-political reforms and social awareness surrounding mental health, stigma and fear are still prevalent, and mental health services are being underutilized. Especially, in the recent uncertain times during the COVID-19 pandemic, fear, worry, and stress are normal responses to perceived or real threats (WHO, 2020c). In addition to the fear of contracting the virus in a pandemic, there have been significant changes to our daily lives as movements are restricted in support of efforts to contain and slow down the spread of the virus. Focus on mental health is essential as we are faced with new realities of working from home, temporary unemployment, home-schooling of children, and lack of physical contact with other family members, friends, and colleagues. If there is substantial discordance between clinical needs and individuals' perceived need for care, policy initiatives designed to improve health care delivery by increasing access may be hindered. The large disparity between the number

of people estimated to suffer from mental disorders and the proportion of those who receive adequate and appropriate treatment for these disorders, known as the ‘treatment gap’, is the core concern of an emerging discipline in global mental health (Patel, 2012).

UNIQUE CONTRIBUTION, SPECIFIC AIMS, AND RESEARCH QUESTIONS

KNOWLEDGE GAP

The objective of this dissertation is to address the knowledge gaps in understanding the barriers and disparities to mental health service utilization in the pediatric and geriatric population along with understanding the ecology of mental health among adolescents. These disparities and barriers can have a direct impact on the overall health outcomes and academic achievements which could lead to reduced quality of life and overall health along with an increased burden on society. Creating plots and maps to identify disparities in adequate mental health service utilization will help us identify the specific geographic areas and barriers to design state health programs and policies.

The national-level prevalence of mental illness and consequent mental health service utilization among pediatric and geriatric age groups will help focus on specific barriers that need attention and can help policymakers’ advance guidelines for better distribution of resources. It is important to have updated data on the prevalence and correlates of mental health treatment. Most available information on the topic is based on surveys that are now more than five years old or present with only annual estimates. Our findings will help health care providers who provide mental health services to reanalyze their work culture and create a more culturally sensitive space to improve overall mental health care delivery.

The central hypothesis of this dissertation is that among the people with a diagnosis of a mental health condition, multiple patient-level characteristics act as a barrier and directly impact the mental health service utilization and overall health outcomes of the individual.

MOTIVATION FOR THE STUDY

Mental health issues are a major public health concern and could have a direct or indirect impact on the overall health of individuals and society. The factors that influenced and drove the areas of interest in the study are (i) access to mental health services is a crucial public health concern (ii) prevalence of mental illness is burgeoning despite specific health and policy reforms (iii) gaps in knowledge related to barriers and disparities in accessing adequate mental health services exist at multiple levels, and (iv) lack of comprehensive literature showing the association between individual, family, and community-level factors and the overall health outcomes.

INNOVATION OF THE STUDY

This is the first study to analyze large national individual-level data to identify the barriers to and disparities in mental health service utilization among pediatric and geriatric age groups in a comprehensive manner. In addition, the study describes the impact of these disparities and barriers on the academic achievements and overall health outcomes of children below 18 years of age. The previous literature analyzed barriers in isolation and lacks significantly in providing all-inclusive information. Hereby, it is anticipated that the findings from this study will be able to provide evidence to public health professionals and policymakers to revise current policies and form new programs to address this concern.

SPECIFIC AIMS

Mental health is a major concern for health care systems and policymakers. Several health reforms have been implemented to provide better access to mental health services including the Affordable Care Act (ACA); however, the prevalence of mental illness has been increasing constantly. Literature reports individual barriers but lacks in providing a comprehensive analysis of factors that need to be addressed to improve mental health service utilization. Though extensive literature exists which identifies and bases the theoretical concepts behind various barriers and disparities, there is scant evidence from patient-reported data to describe the extent of these barriers for policymakers to make changes. The specific aims of the dissertation are as follows:

Study 1

Aim 1: Examine the financial and non-financial barriers that impact mental health service utilization among children below 18 years of age.

Hypothesis 1: Children are unable to receive adequate mental health services due to inadequate insurance.

Hypothesis 2: Racial disparity results in poor utilization of mental health services.

Aim 2: Examine the financial and non-financial barriers that impact academic outcomes among children below 18 years of age.

Hypothesis 1: Difficulty in accessing mental health care results in poor academic performance among children.

Hypothesis 2: Physical and mental health of a parent directly impacts academic performance among children.

The goal of the first study is to understand the financial and non-financial barriers that impact mental health service utilization and academic outcomes among children. Although CHIP provides low-cost or no-cost coverage and the MHPAEA (MHPAEA, Pub.L. 110-343) has made coverage of mental health services less restrictive, there is a significant gap to improve the health care utilization (Centers for Medicare & Medicaid Services, 2010). The findings from this study will help better understand patient level and insurance level factors that are associated with poor mental health service utilization and academic performance. Also, the findings shall help policymakers to shift their attention to non-financial barriers as focusing only on the financial barriers could further expand the disparity in access to care for certain populations.

Study 2

Aim 1: Identify the impact of disparities on mental health service utilization among the elderly.

Hypothesis 1: Racial disparity is the most significant reason for poor health care utilization among the elderly.

Aim 2: Illustrate the association of health care behavior in terms of compliance among the elderly with underlying chronic conditions with mental health service utilization.

Hypothesis 1: The elderly who are compliant with prescription medicine for chronic conditions are more likely to utilize prescription medicine for mental health disorders.

The goal of the second study is to understand the disparities in mental health service utilization among the elderly. Also, the goal is to describe the association between health behaviors for underlying chronic conditions and mental health care

utilization which could help providers better understand the reasons for non-compliance among the elderly. These findings could assist providers to be more culturally sensitive, create simple mediation regimes, educate patients, and improve compliance with mental health services.

Study 3

Aim 1: Understand the individual, family, and community-level factors among adolescents and their impact on mental and physical health status.

Hypothesis 1: Adverse childhood experiences impact the overall health outcomes of adolescents.

Hypothesis 2: Physical and mental health of parents directly impacts the health outcomes of adolescents.

Hypothesis 3: Safe neighborhood and safe school environment impact the overall health outcomes of adolescents.

Hypothesis 4: Engaging in physical activity improves physical and mental health outcomes among adolescents.

Hypothesis 5: Good parent-adolescent relationship improves physical and mental health outcomes among adolescents.

Aim 2: Understand the individual, family, and community-level factors among adolescents and their impact on mental toughness/flourishing behavior.

Hypothesis 1: Adverse childhood experiences negatively impact the mental toughness/flourishing behavior of adolescents.

Hypothesis 2: Higher physical activity improves mental toughness/flourishing behavior among adolescents.

The goal of the third study is to understand the various individual, family, and community-level factors that impact physical and mental health outcomes among adolescents. Adverse childhood experiences play a significant role in shaping the overall health outcomes and the study findings could help policymakers implement or update school or community programs to assist such adolescents. Furthermore, new programs can be initiated to provide better social support for both adolescents and their families.

CHAPTER 2: CONCEPTUAL FRAMEWORK

STUDY 1 AND STUDY 2

Understanding health service utilization is essential to design and develop policies according to public needs. The Andersen health care utilization model is the most common framework used to study health service access and utilization (Andersen, Ronald, 1968; Andersen, Ronald M., 1995). Andersen's model has been frequently applied in studies for diverse racial and ethnic populations as well as for mental health service use and attitudes (Akresh, 2009; Derose, Gresenz, & Ringel, 2011). The model presents three major components of predisposing, enabling, and need factors. Predisposing factors reflect beliefs around using services and include demographics, social structure, and health beliefs. Enabling factors included the resources available at individual, family, and community levels such as income, health insurance, source of care, access to a health care provider, etc. Need factors refer to the perceived needs of a patient and clinically evaluated needs such as self-reported mental health problems and clinically diagnosed chronic conditions. The model was modified according to the factors analyzed in the first and second study and is displayed in Figure 1.

Predisposing factors: These factors include the demographic, socio-economic, or genetic factors which are present in an individual before they develop a need for utilizing health services. The central predisposing factors include age, gender, and race/ethnicity which thereafter help identify high-risk populations.

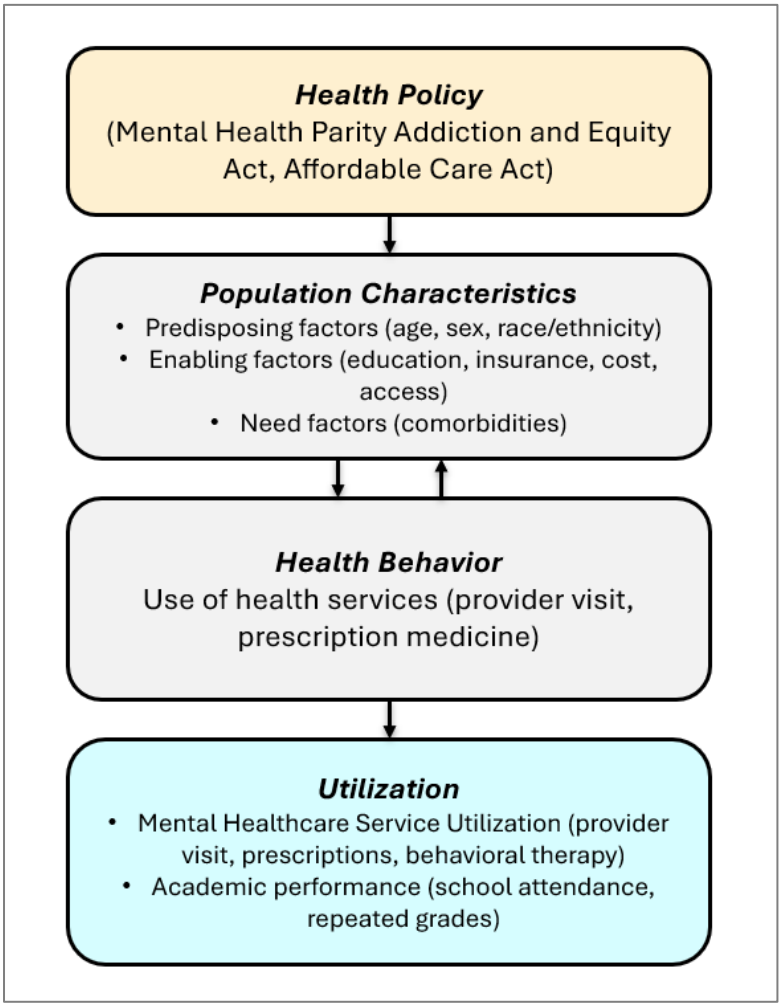
Enabling factors: The enabling factors play a crucial role in assessing health care utilization as some cultures associate stigma with mental illness (Corrigan, Patrick W., 2000; Corrigan, Patrick W. & Watson, 2002; Vogel, Wade, & Hackler, 2007). They refer to the resources such as financial, social, or healthcare access related factors including the level of education, type of insurance, insurance benefits, out-of-pocket costs for

obtaining health care, difficulty in seeing a health care provider, difficulty in obtaining referrals, etc.

Need factors: The need for health services is higher in individuals who either self-report any illness or have a clinical evaluation or diagnosis. Elderly people are more prone to have multiple underlying chronic conditions like Diabetes Mellitus, Hypertension, Hypercholesterolemia, etc. Mental illness can further deteriorate and complicate these comorbidities and the overall health outcomes among such individuals (Egede, Zheng, & Simpson, 2002; Frasure-Smith, Lespérance, & Talajic, 1993). Also, the elderly are more likely to have complex poly-prescription regimens which could result in underuse or overuse of these medications. Similarly, children with a clinical diagnosis of mental health conditions such as Autism, ADHD, etc., would need a higher amount of health services.

Health behavior: Noncompliance with prescription medication is one of the most important reasons for mortality among the elderly (Hagger & Orbell, 2003). Compliance with prescription medication or general health services could potentially be associated with their behavior towards utilization of mental health services as well.

Figure 1: Conceptual framework for Studies 1 and 2 based on Anderson's Health Care Utilization Model



STUDY 3

The social-ecological model was introduced as a theoretical model by Bronfenbrenner (1977) who described human development as a dynamic interaction among several systems such as individual, microsystem (family), mesosystem, exosystem (neighborhood, school), and macrosystem. Several studies have used the social-ecological model to describe relationships between various factors among people with mental illness (Cramer & Kapusta, 2017; Kloos & Shah, 2009). We modified this model to include the individual-, family-, and community-level factors to describe physical and mental health outcomes among adolescents as shown in Figure 2.

Individual characteristics

These factors include person-level characteristics which are unique to an individual such as age, gender, race/ethnicity, body mass index (BMI), physical activity, etc.

Family characteristics

These factors are essential to better understand the overall health outcomes of adolescents as family members create the closest social group and the immediate environment for growth with direct influence on behavior. The parent-level characteristics such as health status of parent, type of health insurance, affordability of food, etc. can directly impact mental health outcomes among adolescents. Nearly half of the children in the US have a history of ACE which has been linked with series of problems in adulthood such as depression, drug abuse, and chronic health conditions (Bethell, Newacheck, Hawes, & Halfon, 2014; Chapman et al., 2004; Chartier, Walker, &

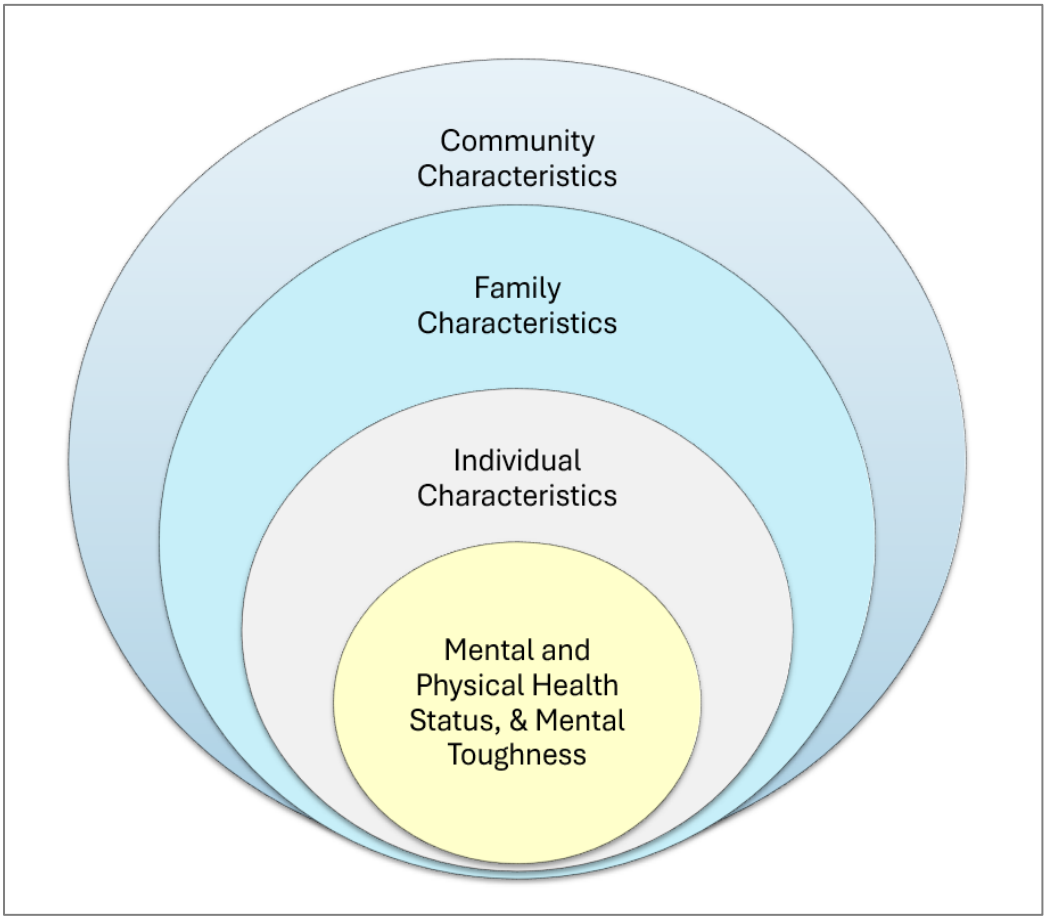
Naimark, 2010; Dube, Anda, Felitti, Edwards, & Croft, 2002). These findings will help policymakers to design strategies to promote healthy relationships and family-level prevention programs for ACE.

Community characteristics

Adolescents spend almost half of their days away from home in the community which includes neighborhood, school, extra-curricular activities such as sports team/lessons, clubs, or organizations after school or on weekends, or any other organized activities/lessons such as music, dance, language, arts, etc. A safe and supportive community can impact the behavior and thinking pattern of an adolescent and thereby alter their health outcomes.

With an overlap at each level, the conceptual framework helps identify areas of concern that need to be addressed. Policymakers can develop and implement programs at the community level by considering all the factors that play a role in influencing health outcomes holistically.

Figure 2: Conceptual framework for Study 3 based on Social Ecological Model by Bronfenbrenner



CHAPTER 3: IMPACT OF FINANCIAL AND NON-FINANCIAL BARRIERS ON MENTAL HEALTH SERVICE UTILIZATION AND ACADEMIC OUTCOMES AMONG CHILDREN WITH AUTISM/ADHD

ABSTRACT

Purpose: Mental health disorders among children usually present as delayed development of age-appropriate thinking, behavior, emotions, or social skills. Autism/Autism Spectrum Disorder (ASD) and attention deficit hyperactivity disorder (ADHD)/attention deficit disorder (ADD) are among the most prevalent mental health disorders in the pediatric age group. Studies have shown that the prevalence of ASD has increased globally within the last couple of decades and as of 2016, 6.1 million (9.4%) children aged 2-17 years living in the US had been diagnosed with ADHD. The literature provides only a partial picture of the health care experiences of these children and their families. Moreover, there is meager evidence of how these conditions impact the academic performance of children. The objective of this study is to identify the impact of affordability and accessibility barriers for mental health service utilization and academic outcomes among children.

Methods: Using data from the National Survey of Children's Health, 2016-2018, 12,297 children in the age group 3-17 years with a diagnosis of Autism/ASD or ADHD/ADD were identified. Bivariate analysis was performed using the Pearson Chi-square test and multivariable logistic regression was used to determine the association between independent and dependent variables. The data were weighted in survey data analysis to produce individual-level nationally representative results.

Results: Female children, Hispanic, and Asians were more likely to report non-utilization of mental health treatment. 51.2% ($p<0.01$) of children with a mental health diagnosis did not receive behavioral therapy and 44.2% ($p<0.01$) did not take

prescription medicine. 70.9% ($p<0.01$) of children had more than one missed school day and 14.8% ($p<0.01$) had repeated grades since kindergarten. The regression model showed a higher odd of these children experiencing accessibility barriers such as difficulty obtaining care from a mental health provider (OR: 5.81, 95% CI: 3.38-10.00) or difficulty obtaining referrals (OR: 1.89, 95% CI: 1.25-2.86).

Conclusion: Affordability and accessibility barriers are associated with poor mental health utilization and academic performance. Unmet mental health needs highlight the importance of targeted policies and programs to improve mental healthcare delivery for children. Spreading awareness and reducing stigma could potentially impact the behavioral patterns of families towards seeking mental healthcare.

INTRODUCTION

Mental health disorders usually present as delayed development of age-appropriate thinking, behavior, emotions, or social skills among children. Autism/Autism Spectrum Disorder (ASD) and attention deficit hyperactivity disorder (ADHD)/attention deficit disorder (ADD) are among the most common mental health disorders among the pediatric age group (CDC, 2005; Durkin et al., 2017). The second most common serious developmental disability affecting children in the US is ASD which is characterized by a persistent deficit in social communication, interactions, and restricted, repetitive patterns of behaviors or interests (Kogan et al., 2018). The prevalence of ASD has increased globally within the last two decades (CDC, 2020a).

Though there is not enough research in this field, some researchers have suggested that the reasons behind this trend are factors such as increased provider availability for children, increased rate of health literacy among parents, ongoing policy reforms and educational campaigns, etc. (CDC, 2006; Zablotsky et al., 2015). One of the

other very common mental health disorders is ADHD/ADD which typically presents as inattention and impulsive behavior, and may also include hyperactivity, beginning early in childhood and often prevailing into adulthood. Researchers have shown that as of 2016, 6.1 million children aged 2-17 years living in the US (9.4% of all children in the age group in the US) had been diagnosed with ADHD (Danielson et al., 2018). The negative impact of poor mental health during early life persisting into adulthood leads to poor academic outcomes (Woodward, L. J. & Fergusson, 2001), increased risk of co-occurring mental health conditions (Pine, Cohen, Gurley, Brook, & Ma, 1998), deteriorating life quality and satisfaction (Layard, Clark, Cornaglia, Powdthavee, & Vernoit, 2014), and an economic burden on the society (Fineberg et al., 2013).

Studies have suggested that children with Special Health Care Needs (SHCN) including ASD and ADHD, might experience barriers to needed health services (Lewis, 2009; Van Dyck, Kogan, McPherson, Weissman, & Newacheck, 2004). During the 1990s, concerns were raised regarding reforms in the management, financing, and delivery of health care in the US among healthcare providers, public health advocates, and policymakers for children with SHCN (Kuhlthau et al., 1998; Newacheck, McManus, Fox, Hung, & Halfon, 2000). More than 12 million children with SHCN lived with chronic physical, developmental, and behavioral conditions in the nation, in need of more healthcare related services than those without SHCN (Newacheck et al., 1998). Children with mental health disorders have greater health service needs, including therapy, emergency department care, physician visits, and sometimes hospitalizations (Kogan et al., 2009).

Some national studies have compared the disparities in health services and challenges for families while raising a child diagnosed with ASD (Kogan et al., 2008). Though Autism/ASD has no known cure, the first line of treatment involves alleviating

the symptoms with behavioral, language, speech, physical, and occupational therapies (Eldevik et al., 2009). Specialty health services including behavioral and educational interventions target communication, social skills, daily functions, academic achievements, and leisure skills (Copeland & Buch, 2013; Myers, S. M. & Johnson, 2007). Behavioral therapy has been considered as the cornerstone treatment for ADHD/ADD and is successful if started immediately post-diagnosis (Pelham Jr & Fabiano, 2008). Families of such children with mental health conditions have reported greater difficulty in accessing healthcare along with poor satisfaction with health services (Krauss, Gulley, Sciegaj, & Wells, 2003; Liptak et al., 2006; Montes, Halterman, & Magyar, 2009). Reports from survey data in the past have shown poor mental health service utilization with an estimate that 25-56% of the children below 18 years of age with mental health disorders access to care from a mental health specialist (Merikangas et al., 2011).

Several factors act as a barrier to adequate mental health services and eventual care utilization such as the cost of health care, physical disability, challenges with transportation, geographic location, poor health literacy, knowledge and beliefs about psychiatric symptoms, treatment options, and their potential effectiveness, insurance coverage, access, and availability of needed care, etc. Even though national data show that the proportion of uninsured families has decreased over time, access to appropriate healthcare, including mental health services, has not improved significantly since 2000 (US DHHS, 2017). Other than the barriers specific to healthcare utilization, multiple indirect barriers such as language, cultural norms, fear and stigma, lack of awareness of available services, access restrictions, long waiting times, pose a challenge in seeking mental healthcare as well.

Parental attitudes surrounding mental health and its care services cannot be neglected as they have been shown to influence help-seeking decisions. Beliefs such as mental illness occur due to a child's personality (Yeh, Forness, Ho, McCabe, & Hough, 2004), negative perceptions of mental disorders (Logan & King, 2001), and perceived stigma (Gronholm et al., 2015), have been associated with reduced help-seeking behavior. Research suggests improved access to mental health services when a parent talks about their child's mental health with a primary care practitioner (Sayal & Taylor, 2004). Therefore, identifying the perceived barriers and facilitators to the initial access to treatment among parents is essential to improve mental health service utilization. Moreover, inadequate healthcare utilization for mental health disorders leads to poor academic achievement and performance. Despite emerging evidence of negative school experiences that interrupt these children's full participation in education and other school activities, research on school non-attendance in students with Autism/ASD or ADHD/ADD is meager (Goodall, 2018).

While informative, the literature on the barriers and health care access among children with Autism/ASD or ADHD/ADD is deficient and provides only a partial picture of the health care experiences of these children and their families. This study focuses specifically on this gap in the literature, with an emphasis on the unmet health care needs of children with Autism/ASD or ADHD/ADD due to multiple financial and non-financial barriers. To the best of our knowledge, no recent study has analyzed multi-year national-level data and provides estimates of barriers for mental health care utilization among children 3-17 years of age with a diagnosis of Autism/ASD or ADHD/ADD. The objectives of this study are to (i) describe the impact of financial and non-financial barriers on mental health service utilization, and (ii) describe the impact of financial and non-financial barriers on children's academic outcomes/performance.

METHODS

Data Source and Applicable Study Population

We used 2016-2018 National Survey of Children's Health (NSCH) data as the primary source of analysis. NSCH collected national and statewide data on the physical and emotional health of non-institutionalized children (age 0-17 years) in the US (US Census Bureau, 2020b). The Bureau sampled households randomly and contacted them by mail to identify those with one or more children under 18 years old. One child was then randomly selected to be the subject of the survey. The survey respondents who were either a parent or primary caregiver aware of the child's health and health care needs were provided with a detailed age-specific questionnaire. The respondents from each household were nested based on their addresses linked with the administrative records and the state of residence. The children below five years of age and those with SHCN were oversampled for a more robust estimate of the population and to avoid potential age bias among children with SHCN. The NCHS Research Ethics Review Board approved all data-collection procedures.

For this study, we included children with a diagnosis of Autism/ASD (including Asperger's Disorder and Pervasive Developmental Disorder), or ADHD/ADD. As this data was collected only among children of age 3 years and above, we limited our study population to children of ages 3-17 years. These inclusion criteria provided a study sample consisting of 12,297 children.

Dependent variables

Mental health service utilization and academic outcomes among children were analyzed as two separate groups of outcome variables. Service utilization was

measured using three variables: (i) Child took behavioral therapy: two survey questions were used to measure the utilization of behavioral therapy which asked, ‘Did the child currently or in the past 12 months take behavioral treatment such as training or intervention for Autism/ASD’ and ‘Did the child currently or in the past 12 months take behavioral treatment such as training or intervention for ADHD/ADD’. The responses were categorized into binary categories of yes and no, (ii) Child received treatment from mental health provider: the survey question asked, ‘During the last 12 months, has the child received any treatment or counseling from a mental health professional?’ The responses were categorized into binary categories of yes and no, and (iii) Child took prescription medication: Responses from two survey questions were combined to measure prescription medication utilization by asking ‘Is the child currently taking prescription medication for autism/ASD’ and ‘Is the child currently taking prescription medication for ADHD/ADD’. The variable was coded into binary categories of yes and no.

The academic outcomes were measured using two variables: (i) Missed school days: the survey question asked, ‘did the child miss days in school in the last 12 months due to illness’ and (ii) Repeated grades: the survey question asked, ‘starting since kindergarten, has the child repeated any grades?’. Both variables to measure academic outcomes were categorized into binary categories of yes and no.

Independent variables

The primary independent variables were divided into two groups of financial (affordability) and non-financial (accessibility) barriers.

Financial barriers: The variables representing financial barriers included (i) Out of pocket cost of treatment: the survey questionnaire asked the parents 'Including co-pays and amounts from Health Savings Accounts (HSA) and Flexible Spending Accounts (FSA), how much money did you pay for this child's medical health, dental, and vision care during the past 12 months?' The responses were categorized into less than $999, $1000-$5000, and more than $5000. The respondents were asked not to include health insurance premiums and costs which would be reimbursed by insurance or any other source. (ii) Insurance benefits meet child's health needs: the questionnaire asked 'Does the current insurance benefits meet child's health care needs' and the responses were categorized as always/usually, sometimes/never, and the child is uninsured (iii) Insurance offers benefits specific to mental health needs: the parents were asked 'thinking specifically of child's mental/behavioral health, how often does the child's health insurance offer benefits or cover services that meet mental health care needs' and the responses were categorized as always/usually, sometimes/never, and uninsured.

Non-financial barriers: Three variables were used to assess the non-financial barriers that depicted problems with access to health care. (i) Level of difficulty in receiving needed treatment or counseling from a mental health professional: the parents were asked 'how difficult was it to get the mental health treatment or counseling that the child needed.' The responses were categorized as not difficult, somewhat/very difficult, and did not need care (ii) Level of difficulty in getting a referral: the parents were asked 'in the last 12 months, how difficult was it to get referrals for this child or see a doctor or receive health care services?' The responses were categorized as not difficult, somewhat/very difficult, and did not need a referral (iii) Overall health status of the child's parent in case they were the primary caregiver for the child: survey responses to two variables were combined to assess the overall health status of the parent with the

following survey questions ‘If this child’s mother is a primary caregiver and lives in the household, are his/her mother’s physical and mental health both excellent or very good?’ and ‘If this child’s father is a primary caregiver and lives in the household, are his/her father’s physical and mental health both excellent or very good?’. The responses were categorized as excellent, fair/poor, and no parent reported in the household.

In addition to the primary explanatory variables, demographic and socio-economic variables were adjusted for in the multivariable regression analysis. The factors included age, gender, race/ethnicity (non-Hispanic White, Hispanic, Black, Asian, and American Indian/Alaskan Native/Native Hawaiian/Pacific Islander [AI/AN/NH/PI]), level of education of parent (high school or less, some college/technical school, and a college degree or higher), and the type of insurance (private only, public only, multiple, and uninsured). The type of health insurance was derived using two survey questions ‘whether the child was currently insured’ and ‘type of child’s insurance’. The responses were categorized as private, public, multiple, and uninsured. Private insurance was defined as insurance through a current or former employer or union, insurance purchased directly from an insurance company, TRICARE, other military health care, coverage through the Affordable Care Act (ACA), or other private insurance. Public insurance was defined as Medicaid, medical assistance, or any kind of government assistance plan for those with low income or disability. The children covered with both public and private types of insurance were categorized as having multiple insurances and the children covered under only Indian Health Services or a religious health share were considered uninsured.

For the sensitivity analyses, the non-financial variables ‘level of difficulty in receiving needed treatment or counseling from a mental health professional’ and ‘level of difficulty in getting a referral’ were recategorized. For the first analysis, the survey

responses were categorized as did not need care, not difficult, and very difficult/could not obtain care. For the second analysis, the survey responses were categorized as not difficult if needed care and very difficult/could not obtain care.

Analysis

We present descriptive summary statistics of each variable among the total study population and stratified by behavioral therapy utilization among children. Bivariate analysis was performed using the Pearson Chi-square test, to examine the differences in each variable between children who did and did not utilize behavioral therapy for a diagnosis of Autism/ASD or ADHD/ADD. Multivariable logistic regression was conducted to investigate the association between the independent and dependent variables after adjusting for age, gender, race/ethnicity, and other demographic and socioeconomic variables.

All estimates were adjusted with probability weights, primary sampling unit, and strata in survey data analysis to generate nationally representative individual-level estimates. Average weights were constructed for three years to report multi-year population estimates (US Census Bureau, 2020c). For bivariate analysis, the p-values were calculated with a significance level of 0.05. Sensitivity analyses were performed by recategorizing multiple independent variables (difficulty in getting care from a mental health provider, difficulty in getting a referral, insurance meets child's health needs, and insurance offers benefits specific to mental health needs).

University of Nebraska Medical Center (UNMC) Institutional Review Board (IRB) review was waived as the participant information was de-identified in the public use file. The data were analyzed, and two-way plots were created using STATA MP v 16.1 (Stata

Statistical Software: Release 16.1. College Station, TX: StataCorp LLC). The data were mapped using ArcGIS software, Version 10.4 (Esri, Redlands, CA).

RESULTS

The descriptive summary statistics of the demographic and socio-economic variables were presented among the total study population and stratified by behavioral therapy utilization in Table 1. 70% of our total study population were male children. 43% ($p<0.01$) of the children had a parent with an education level of college or above and 52.8% ($p<0.01$) of the children had a parent with fair or poor overall health status. 47.7% ($p<0.01$) of the children were covered with private insurance. Among the children who did not take behavioral therapy, 66.9% were males, 32% of children had a parent with a high school degree, 5% were uninsured, and 51.2% of the children had a parent or primary caregiver with fair/poor physical and mental health.

The financial (affordability) and non-financial (accessibility) barriers were presented among the total study population and stratified by behavioral therapy utilization in Table 2. 24.3% ($p<0.01$) of the children had a parent reporting difficulty in receiving care from a mental health professional and 8% ($p<0.01$) reported difficulty getting a referral. 13.3% ($p<0.01$) of the children had insurance that never covered needed mental health services. Among the children who did not utilize behavioral therapy for a diagnosis of Autism/ASD or ADHD/ADD, 16.3% and 5% of children had a parent reporting extreme difficulty or unable to obtain health care from a mental health professional or obtain a needed referral, respectively.

The descriptive statistics for the outcome variables measuring mental health service utilization and academic performance are presented in Table 3. Among all

children with a diagnosis of Autism/ASD or ADHD/ADD, 7% ($p<0.01$) did not receive care from a mental health professional, 44.2% ($p<0.01$) did not take prescription medicine, and 51.2% ($p<0.01$) did not take behavioral therapy such as training or intervention. 70.9% ($p<0.01$) of children had more than one missed school day and 14.8% ($p<0.01$) had repeated grades starting since kindergarten. Among the children who did not utilize behavioral therapy as a treatment, 69.4% missed more than one school day.

Using multivariable logistic regression models, we demonstrated the association of non-financial and financial barriers with mental health service utilization (visiting a mental health professional, taking prescription medication, and taking behavioral therapy) in Table 4. Compared to the parents who did not have any difficulty in getting health care from a mental health professional, the children whose parents had some/extreme level of difficulty in obtaining such services had 1.39 times higher odds of not receiving behavioral treatment/therapy for a diagnosis of Autism/ASD or ADHD/ADD (odds ratio [OR]: 1.39, 95% confidence interval [CI]: 1.03-1.87). Also, children had 5.81- and 1.31-times higher odds of not receiving needed mental health care (OR: 5.81, 95% CI: 3.38-10.00) and prescription medication (OR: 1.31, 95% CI: 1-1.75) when their parents had some/extreme level of difficulty in obtaining health care from a mental health professional, respectively.

Compared to the children who had insurance that always covered needed mental health services, the uninsured children had 17.1 times higher odds of not receiving care from a mental health professional (OR: 17.1, 95% CI: 9.51-30.9). Moreover, uninsured children had 1.76- (OR: 1.76, 95% CI: 1.35-2.30) and 3.47- (OR: 3.47, 95% CI: 2.66-4.54) times higher odds of not taking prescription medication, and not receiving behavioral treatment/ therapy for their mental illness, respectively. The children covered

with an insurance plan that sometimes/never covered the needed mental health services were 53% more likely to not take prescription medication for their mental health condition (OR: 1.53, 95% CI: 1.09-2.14).

A multivariable logistic regression model was used to determine the association of non-financial and financial barriers with academic outcomes among children as depicted in Table 5. Children with a parent/primary caregiver reporting fair/poor physical and mental health (OR: 1.33, 95% CI: 1.06-1.68) were 33% more likely to have missed more than one school day. Also, children who had difficulty receiving care from a mental health professional (OR: 1.51, 95% CI: 1.09-2.09), and children who had difficulty in obtaining a referral to see a doctor or receive needed health care services (OR: 1.89, 95% CI: 1.25-2.86) were 51% and 89% more likely to have missed more than one school days, respectively. Moreover, compared to the children covered with an insurance plan whose benefits always met their health needs, the children with insurance benefits that sometimes or never met their health needs were more likely to have repeated grades since kindergarten (OR: 2.18, 95% CI: 1.11-4.30). Figure 3 shows a two-way plot to depict the association of school absenteeism with non-financial barriers.

Tables 4 and 5 also display the estimates of demographic and socio-economic factors with mental health care utilization and academic outcomes, respectively. Female children (OR: 1.65, 95% CI: 1.31-2.08) and the children in the age group 13-17 years (OR: 2.35, 95% CI: 1.72-3.23) were found more likely to not receive behavioral therapy for mental illness. The Hispanic (OR: 2.20, 95% CI: 1.64-2.94) and Asian (OR: 5.18, 95% CI: 2.85-9.43) children were very likely to not receive prescription medicine for their mental health diagnosis. Also, the children who had a parent with an education level of college or above were more likely to receive care from a mental health professional (OR:

0.38, 95% CI: 0.22-0.66) compared to those with a high school degree/GED or less. Female children were less likely to repeat grades (OR: 0.70, 95% CI: 0.52-0.95) and the children identified as Black were less likely to miss school days (OR: 0.64, 95% CI: 0.47-0.88). The children with a parent or primary caregiver with an education level of college or above were less likely to repeat grades (OR: 0.63, 95% CI: 0.43-0.94). Also, the children covered with public insurance only (OR: 2.10, 95% CI: 1.52-2.91) or both public and private insurance were more likely to repeat grades than those covered by private insurance only (OR: 1.77, 95% CI: 1.18-2.65).

The estimates from two sensitivity analyses are presented in Appendix A and Appendix B. The results were very similar to the results from the main analysis and did not show any significant differences.

DISCUSSION

This study presents a fresh set of findings for the prevalence of financial and non-financial barriers for mental health care utilization and academic performance among the pediatric population with a diagnosis of Autism/ASD or ADHD/ADD. Some of the major findings from the study showed (i) Children with Autism/ASD or ADHD/ADD experience difficulty obtaining care from a mental health provider or difficulty obtaining referrals for needed mental health services, (ii) Children with Autism/ASD or ADHD/ADD missed more than one school day or repeated grades, (iii) Uninsured children reported higher non-utilization of needed health services such as seeing a mental health provider, take prescription medication or behavioral therapy compared to children with private insurance, and (iv) Female children, Hispanic, and Asian children were less likely to utilize prescription medicine or behavioral therapy for mental health disorder compared to males and Non-Hispanic White population, respectively. As behavioral therapy is

considered as the cornerstone treatment among children with a diagnosis of autism/ASD or ADHD/ADD (Myers, S. M. & Johnson, 2007; Pelham Jr & Fabiano, 2008), it was important to measure the adequate mental health service utilization. Figure 4 shows a GIS map for the state-wise distribution of children who did not receive care from a mental health provider for autism/ADHD. This depiction will help identify states with access problems and design targeted strategies.

This study fills in the information gap in the literature by providing a comprehensive analysis using large, multi-year, national-level data and presents the current prevalence of Autism/ASD or ADHD/ADD among the pediatric population. After controlling for demographic factors such as age, gender, race, etc., we demonstrate the association between financial/affordability barriers (out of pocket cost, insurance benefits meets health care needs, insurance covers needed mental health services) and non-financial/accessibility barriers (difficulty in obtaining care from a mental health provider, difficulty in obtaining a referral, and overall health status of the parent) with adequate mental health service utilization and academic outcomes.

Previous research has shown that provider-based access problems increase significantly among children with a mental health condition (Chiri & Warfield, 2012). Also, researchers have suggested the type of insurance plan to be an important factor to determine health utilization (DeRigne, Porterfield, & Metz, 2009). However, there is a lack of formal research describing the association between the insurance status with healthcare utilization for Autism/ASD or ADHD/ADD. Multiple researchers have reported findings for insurance and healthcare utilization among children with SHCN. However, the findings have been inconsistent with some studies suggesting private insurance to be better in providing access to services (Newacheck et al., 2000), some suggesting Medicaid to be better (Liptak, Stuart, & Auinger, 2006), and some others reporting no

difference at all among multiple types of insurance (Kuhlthau, Nyman, Ferris, Beal, & Perrin, 2004). In the past literature, no study using national data has made a direct comparison between public and private insurance for health service use among the pediatric population with autism/ASD or ADHD/ADD. Some findings from our study about unmet mental health needs were consistent with what has been previously reported in the studies that researched this domain (Kogan et al., 2008; Pelham Jr & Fabiano, 2008). Many times, private insurance plans exclude vital services for children with ASD by stating them as hypothetical/experimental (Barry, Colleen L. et al., 2003; Rogers & Vismara, 2008). The children who are covered under private insurance only are likely to be at risk of being under-insured (Fox & Newacheck, 1990). Our study findings showed no significant difference between private and public health insurance and adequate mental health service utilization. However, we found that children with multiple insurance plan coverage (both private and public) were more likely to utilize behavioral therapy.

Some researchers have hypothesized that racial/ethnic and socioeconomic inequality act as vital contributors to parental beliefs (Mandell & Novak, 2005; Zuckerman, Mattox, Sinche, Blaschke, & Bethell, 2014). The findings from this study were comparable with previous studies that have shown such disparities in seeking health care for mental illness among Hispanics (Delphin-Rittmon et al., 2013). Though intensive research has been conducted on racial disparities for appropriate health care utilization previously; no recent study has shown racial disparity as a barrier for mental health service utilization and academic outcomes among the pediatric population. Study findings have suggested that racial minorities in the US have lower mental health care utilization which could potentially be attributed to multiple factors such as cultural beliefs, stigma, acculturation, language barriers, etc. (Chen, S. X. & Mak, 2008).

Stigma has been a common barrier in recognizing mental health issues and eventually seeking mental health care. Several theories about the role of parental belief system have been based on evidence that suggests that parents from minority populations have contradictory views on the utility of mental health care (Bussing, Schoenberg, Rogers, Zima, & Angus, 1998; Yeh, Hough, McCabe, Lau, & Garland, 2004). Some research findings for the use of psychopharmacology among minorities have shown non-Hispanic Black children to be less likely to use psychotropic medication for ASD when compared to non-Hispanic White children (Rowland et al., 2002). Also, some studies showed Latino children less likely to use behavioral therapy which furthers the evidence to demonstrate lower rates of therapy utilization among minority children (Magaña, Lopez, Aguinaga, & Morton, 2013). Our study findings showed that the Hispanic and Asian children were more likely to have low utilization of prescription medicine for diagnosis of Autism/ASD or ADHD/ADD.

Even though a large number of females suffer from ADHD, the scientific literature is almost exclusively based on males. Very few studies have provided theories to explain the reason behind a lower prevalence of ADHD/ADD among female children (Biederman et al., 1999). Our study findings showed that female children were less likely to utilize behavioral therapy. Parents of children with ASD are often under a high amount of stress due to the diverse challenges encountered while caregiving (Hayes & Watson, 2013). Researchers have shown that families of children with Autism/ASD struggle with accessing basic health care such as finding providers with the necessary skills to provide needed therapy and mental health services (Chiri & Warfield, 2012). Newacheck et al. (2001) examined access to specialty medical care among a nationally representative sample of children who were enrolled in managed care plans. The

researchers found that one-fifth of all children had difficulty in accessing needed specialty care.

Our study findings showed similar results with parents reporting difficulty in obtaining care from mental health providers and eventually not receiving medical or behavioral treatment for their child at all. Parents reported difficulties such as obtaining a referral, inadequate coverage by insurance health plans, inadequate insurance benefits specific to the mental health needs of their child, etc. These findings did not appear unforeseen considering that the literature has suggested that most physicians reported their medical training to be inadequate to diagnose and treat complex conditions. Thereby, the physicians felt incapable to meet the demands of their practice based on a survey of a random sample of US physicians in both primary care and specialty fields (Darer, Hwang, Pham, Bass, & Anderson, 2004). Besides, this also suggests that changes in current medical teaching are needed to improve physicians' ability to treat children with such conditions.

Parental mental health has been suggested to play a vital role in exploring the impact of autism among children (Hastings et al., 2005). Past literature has shown no associations between a low level of parental education and non-attendance in the general student population (Balkıs, Arslan, & Duru, 2016). In contrast, our findings showed that a higher level of education (some college/technical school) among parents is associated with a lower likelihood of children repeating grades and a higher likelihood of absenteeism from school. We found Black children less likely to miss school days which was similar to another study (Locke et al., 2017). Multiple theories behind absenteeism from school are provided in the literature such as inadequate community support services, challenges with transportation, policies on attendance, cultural values, neighborhood characteristics, poverty, household size, etc. (Melvin et al., 2019). In this

study, we found a higher likelihood of absenteeism from school among children whose parents had poor physical or mental health status. Also, the children whose parents had difficulty obtaining provider-based mental health care were more likely to have poor academic performance.

A finding from this study showed that the children who had a parent with an education level of college or higher were more likely to receive care from a mental health professional. This finding should be evaluated in addition to the indirect costs of accessing health care (Koopmanschap & Rutten, 1993). As a parent with a higher level of education is likely to be working, the factors such as waiting time for an appointment, time spent driving to reach the provider, long waiting hours at the doctor's office, etc., add up the indirect costs faced by a parent/caregiver. This could eventually result in a barrier for the parent to be able to take their child to see a mental health provider. Besides these findings are crucial as they highlight the presence of multiple stressors for families of children with disabilities and SHCN (Leiter, Krauss, Anderson, & Wells, 2004).

Several critical factors for unmet health care needs, appropriate health care utilization, and access have been described, but the reasons behind these factors are still ambiguous. This study highlights this gap by focusing on the financial and non-financial barriers. Understanding the nature of disparities is essential to design health policies and provide for the unmet need. In the last decade, both federal and state governments have made efforts to expand health care coverage for children, including those with SHCN such as the State Children’s Health Insurance Program (SCHIP) to ensures appropriate access to care. Continued dialogue around health policies and programs focused on mental health among children is needed to address factors that pose a barrier to adequate healthcare utilization. It is essential to create more social awareness to address stigmatizing beliefs irrespective of race, ethnicity, cultures, etc. to

promote mental healthcare-seeking behavior. Training clinicians to offer culturally sensitive treatment services could be another step to further the trust between provider and patient.

As more and more children with ASD are being enrolled in the mainstream education system, a stronger parent and teacher collaboration is needed to achieve an academic environment that is more supportive than that required by their peers (Schultz, Able, Sreckovic, & White, 2016). Parents could be a source to provide insight into a child's strengths and vulnerabilities, which can be utilized by schools to tailor teaching styles (Volkmar et al., 2014). Literature shows evidence for the effectiveness of active parental involvement in improving academic and social outcomes for students with disabilities (Shepherd & Kervick, 2016). Moreover, parental involvement is considered a crucial practice in the education of students with ASD. However, the collaborative system is rarely considered viable and given due resources (Azad & Mandell, 2016).

During the current Coronavirus pandemic (COVID-19), the pediatric population is using a variety of coping mechanisms to get used to a new normal. In more ways than one, we are dealing with two parallel pandemics: one due to the novel coronavirus and the other by the long-established stigma and beliefs around mental health and its care seeking. Though there is now a vaccine to address the first, the latter still needs a lot of work. Recent public health guidelines recommending self-quarantining, physical distancing, virtual schooling, etc., have reduced access to support systems for children and their families. Though children might not demonstrate detrimental outcomes immediately; the prolonged uncertainty and lack of social and physical activity could potentially increase emotional distress in the long term.

Some recommendations for policy changes at different levels of the system include (i) family-centered mental health care to ensure appropriate planning for both

child and adult mental health (ii) increasing access to adequate health care services by using technology such as Tele-medicine in rural areas and for underserved populations (iii) training first responders to provide psychological first-aid in areas that are hit by natural disasters such as hurricanes, wild-fires, etc., and (iv) capacity building in the society to increase the availability of resources such as trainees, volunteers, teachers, primary care providers, etc., to provide mental health care and counseling.

Limitations

Among the strengths of this study is its large sample size which provides for a higher analytic power. However, the strengths cannot be viewed without considering a couple of limitations. Being retrospective observational data, the NSCH data collected survey responses from parents or primary caregivers about children's physical and emotional health. The data was not verified using medical records which may have led to recall errors. Also, there is a possibility that any parent or caregiver with poor physical/mental health could provide biased responses regarding the child's unmet needs based on their perception. However, there is evidence that suggests parents' responses to be a reliable source to analyze health-related information about children. The CDC Morbidity and Mortality Weekly Report (2006) analyzed 2003-2004 data from the National Health Interview Survey (NHIS) and NSCH to provide an estimate for the population-based prevalence of parental reports of diagnosed autism. Moreover, the report assessed parental reporting of a child’s social, emotional, and behavioral strengths, limitations, and SHCN with and without a diagnosis of autism. Similar estimates across several factors such as age, gender, race/ethnicity, etc., suggesting high reliability for parental reports of diagnosis and management of autism. The survey

responses were thereby considered credible to assess the health and educational needs of such children.

CONCLUSION

This study expands on what is currently known about financial and non-financial barriers to mental health service utilization and academic outcomes among children with Autism/ASD or ADHD/ADD using large nationally representative data. We call attention to a higher unmet need for adequate mental health service utilization among children which articulates that targeted strategies are required to improve the health system. Disseminating educational awareness through social media campaigns on reducing stigma could potentially produce a positive impact on the health behavior of families towards realizing mental health issues and seeking appropriate mental healthcare. Training health care providers who manage children with behavioral disorders will help to provide culturally appropriate assessments and services. This in turn will help diminish disparities among racial groups. School-based programs regarding providing basic mental health services including counseling are essential given the amount of time a child spends in school. The state-level policymakers need to focus on in-school behavioral health services which could impact academic outcomes and the general well-being of children, especially among minority and underserved populations. Continued mental health care should be integrated into primary care practice along with transition plans to adulthood to ensure continuous and appropriate healthcare delivery.

Table 1: Descriptive characteristics for the demographic and socio-economic status stratified by behavioral therapy utilization using the NSCH, 2016-2018

	Total sample	Behavioral therapy for Autism/ASD/ADHD/ADD		
	(n=12,297) n (%)	Yes (n=6,004) n (%)	No (n=6,293) n (%)	P-value
Age category				<0.01
3-7 years	1937 (15.8)	1179 (19.6)	760 (12.1)	-
8-12 years	5330 (43.3)	2771 (46.1)	2561 (40.7)	-
13-17 years	5030 (40.9)	2054 (34.2)	2972 (47.2)	-
Sex				<0.01
Male	8634 (70.2)	4427 (73.7)	4209 (66.9)	-
Female	3663 (29.8)	1577 (26.3)	2084 (33.1)	-
Race/Ethnicity				<0.01
Non-Hispanic White	6813 (55.4)	3103 (51.7)	3708 (58.9)	-
Hispanic	2585 (21.0)	1275 (21.2)	1310 (20.8)	-
Black	1943 (15.8)	1119 (18.6)	826 (13.1)	-
Asian	186 (1.5)	123 (2.0)	64 (1.0)	-
American Indian/Alaskan Native/Native Hawaiian/Pacific Islander	770 (6.3)	384 (6.4)	385 (6.1)	-
Level of education of parent				0.88
High school/GED or less	3906 (31.8)	1884 (31.4)	2021 (32.1)	-
Some college/technical school	3064 (24.9)	1485 (24.7)	1579 (25.1)	-
College or higher	5327 (43.3)	2635 (43.9)	2693 (42.8)	-
Type of insurance				<0.01
Private only	5868 (47.7)	2503 (41.7)	3362 (53.4)	-
Public only	4832 (39.3)	2641 (44.0)	2194 (34.9)	-
Multiple	1026 (8.3)	613 (10.2)	413 (6.6)	-
Uninsured	571 (4.6)	246 (4.1)	325 (5.2)	-
Health status of parent				<0.01
Excellent	4829 (39.3)	2168 (36.1)	2659 (42.3)	-
Fair/poor	6499 (52.8)	3277 (54.6)	3222 (51.2)	-
No parent reported in household	970 (7.9)	559 (9.3)	412 (6.5)	-

* the 'n' shows adjusted frequencies for each variable

* the % depicts adjusted probabilities

Table 2: Descriptive characteristics for the financial and non-financial barriers for mental health service utilization using the NSCH, 2016-2018

	Total sample	Behavioral therapy for Autism/ASD/ADHD/ADD		
	(n=12,297) n (%)	Yes (n=6,004) n (%)	No (n=6,293) n (%)	P-value
Level of difficulty in obtaining care from mental health professional				<0.01
Not difficult	3273 (26.6)	2286 (38.1)	993 (15.8)	-
Somewhat/very difficult	2994 (24.3)	1975 (32.9)	1024 (16.3)	-
Child did not need mental health care	6030 (49.0)	1743 (29.0)	4276 (68.0)	-
Level of difficulty in obtaining a referral				<0.01
Not difficult	2831 (23.0)	1665 (27.7)	1168 (18.6)	-
Somewhat/very difficult	1074 (8.7)	760 (12.7)	316 (5.0)	-
Child did not need a referral	8392 (68.2)	3579 (59.6)	4809 (76.4)	-
Insurance benefits meet child's health needs				0.77
Always/usually	10563 (85.9)	5173 (86.2)	5390 (85.7)	-
Sometimes/never	1156 (9.4)	576 (9.6)	580 (9.2)	-
Uninsured	578 (4.7)	255 (4.2)	323 (5.1)	-
Insurance plan covers needed mental health services				<0.01
Always/usually	6608 (53.7)	4108 (68.4)	2508 (39.9)	-
Sometimes/never	1637 (13.3)	960 (16.0)	678 (10.8)	-
Uninsured	4051 (32.9)	935 (15.6)	3107 (49.4)	-
Out of pocket cost of health care				0.4
Less than $999	9711 (79.0)	4680 (77.9)	5031 (79.9)	-
$1000-$5000	2111 (17.2)	1046 (17.4)	1065 (16.9)	-
More than $5000	475 (3.9)	278 (4.6)	197 (3.1)	-

* the 'n' shows adjusted frequencies for each variable

* the % depicts adjusted probabilities

Table 3: Descriptive characteristics for the mental health service utilization and academic outcomes stratified by behavioral therapy utilization using the NSCH, 2016-2018

	Total sample	**Behavioral therapy for Autism/ASD/ADHD/ADD**		
	(n=12,297) n (%)	Yes (n=6,004) n (%)	No (n=6,293) n (%)	P-value
Receive treatment from mental health professional				<0.01
Yes	11421 (92.9)	5783 (96.3)	5640 (89.6)	-
No	876 (7.1)	221 (3.7)	653 (10.4)	-
Taking prescription medicine for Autism/ASD/ADHD/ADD				<0.01
Yes	6863 (55.8)	3589 (59.8)	3277 (52.1)	-
No	5434 (44.2)	2415 (40.2)	3016 (47.9)	-
Taking behavioral therapy for Autism/ASD/ADHD/ADD				-
Yes	6004 (48.8)	6004 (48.8)	0 (0)	-
No	6293 (51.2)	0 (0)	6293 (51.2)	-
Missed school days				<0.05
0 missed days	3574 (29.1)	1648 (27.5)	1925 (30.6)	-
More than 1 missed school days	8723 (70.9)	4356 (72.5)	4368 (69.4)	-
Repeated grades in school				0.06
Did not repeat grade if enrolled in school	10481 (85.2)	5010 (83.4)	5470 (86.9)	-
Repeated grades	1816 (14.8)	994 (16.6)	823 (13.1)	-

* the 'n' shows adjusted frequencies for each variable

* the % depicts adjusted probabilities

Table 4: Association of non-financial and financial barriers with mental health service utilization using the NSCH, 2016-2018

	Did not receive treatment from mental health professional	**Did not take prescription medicine for Autism/ ASD/ ADHD/ ADD**	**Did not take behavioral therapy for Autism/ ASD/ ADHD/ ADD**
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Age category			
3-7 years	1.00 (-)	1.00 (-)	1.00 (-)
8-12 years	0.89 (0.51 , 1.56)	0.31 (0.23 , 0.41)***	1.26 (0.92 , 1.72)
13-17 years	0.55 (0.31 , 0.99)*	0.35 (0.26 , 0.47))***	2.35 (1.72 , 3.23))***
Sex			
Male	1.00 (-)	1.00 (-)	1.00 (-)
Female	1.39 (0.91 , 2.13)	1.06 (0.86 , 1.30)	1.65 (1.31 , 2.08))***
Race/ Ethnicity			
Non-Hispanic White	1.00 (-)	1.00 (-)	1.00 (-)
Hispanic	1.42 (0.83 , 2.46)	2.20 (1.64 , 2.94))***	0.92 (0.66 , 1.27)
Black	1.08 (0.52 , 2.27)	0.92 (0.65 , 1.30)	0.75 (0.52 , 1.08)*
Asian	1.36 (0.45 , 4.08)	5.18 (2.85 , 9.43))***	0.43 (0.21 , 0.88)
American Indian/Alaskan Native/Native Hawaiian/Pacific Islander	0.57 (0.31 , 1.05)	1.05 (0.78 , 1.41)	0.90 (0.66 , 1.23)
Level of education of parent			
High school/GED or less	1.00 (-)	1.00 (-)	1.00 (-)
Some college/technical school	0.71 (0.42 , 1.18)*	1.21 (0.90 , 1.62)	0.84 (0.61 , 1.16)
College or higher	0.38 (0.22 , 0.66)***	0.98 (0.72 , 1.32)	0.83 (0.60 , 1.15)
Type of insurance			
Private only	1.00 (-)	1.00 (-)	1.00 (-)
Public only	0.72 (0.42 , 1.25)	0.97 (0.72 , 1.30)	0.75 (0.55 , 1.02)*
Multiple	0.60 (0.29 , 1.25)	1.05 (0.74 , 1.47)	0.64 (0.44 , 0.92)*
Uninsured	0.01 (0.00 , 0.10)***	0.41 (0.13 , 1.32)	0.50 (0.03 , 7.34)
Non-financial Barriers			
Health status of parent			
Excellent	1.00 (-)	1.00 (-)	1.00 (-)
Fair/ poor	1.33 (0.83 , 2.12)	0.86 (0.70 , 1.06)	1.09 (0.86 , 1.38)

No parent reported in household	0.72 (0.33 , 1.58)	0.67 (0.45 , 0.98)	1.04 (0.67 , 1.62)
Level of difficulty in obtaining care from mental health professional			
Not difficult	1.00 (-)	1.00 (-)	1.00 (-)
Somewhat/ very difficult	5.81 (3.38 , 10.00)***	1.31 (1.00 , 1.75)	1.39 (1.03 , 1.87)**
Child did not need mental health care	0.00 (0.00 , 0.01)	1.93 (1.49 , 2.51)	3.85 (2.98 , 4.98)
Level of difficulty in obtaining a referral			
Not difficult	1.00 (-)	1.00 (-)	1.00 (-)
Somewhat/ very difficult	1.03 (0.54 , 1.96)	0.68 (0.46 , 1.03)	0.70 (0.45 , 1.09)
Child did not need a referral	1.62 (1.00 , 2.62)	0.93 (0.73 , 1.18)	1.31 (1.02 , 1.68)
Financial Barriers			
Out of pocket cost of health care			
Less than $999	1.00 (-)	1.00 (-)	1.00 (-)
$1000-$5000	1.28 (0.73 , 2.25)	0.67 (0.51 , 0.87)*	0.90 (0.67 , 1.21)
More than $5000	0.53 (0.22 , 1.27)	0.87 (0.54 , 1.39)	0.64 (0.35 , 1.17)
Insurance benefits meet child's health needs			
Always/usually	1.00 (-)	1.00 (-)	1.00 (-)
Sometimes/ never	1.71 (0.90 , 3.24)	0.92 (0.57 , 1.47)	1.16 (0.72 , 1.86)
Uninsured	12.20 (2.17 , 68.51)**	2.43 (0.78 , 7.55)	0.85 (0.06 , 12.90)
Insurance plan covers needed mental health services			
Always/usually	1.00 (-)	1.00 (-)	1.00 (-)
Sometimes/ never	1.49 (0.85 , 2.62)	1.53 (1.09 , 2.14)	1.09 (0.77 , 1.57)
Uninsured	17.15 (9.51 , 30.93)***	1.76 (1.35 , 2.30))***	3.47 (2.66 , 4.54)***

* p-value <0.05
** p-value <0.01
*** p-value <0.001

Table 5: Association of non-financial and financial barriers with academic outcomes using the NSCH, 2016-2018

	Missed school days	Repeated grades
	OR (95% CI)	OR (95% CI)
Age category		
3-7 years	1.00 (-)	1.00 (-)
8-12 years	3.16 (2.32 , 4.31))***	2.55 (1.41 , 4.61))***
13-17 years	3.32 (2.45 , 4.50))***	4.15 (2.31 , 7.45))***
Sex		
Male	1.00 (-)	1.00 (-)
Female	1.11 (0.88 , 1.39)	0.70 (0.52 , 0.95)
Race/ Ethnicity		
Non-Hispanic White	1.00 (-)	1.00 (-)
Hispanic	0.88 (0.65 , 1.20)	1.05 (0.69 , 1.59)
Black	0.64 (0.47 , 0.88))***	1.42 (0.98 , 2.05)
Asian	1.15 (0.63 , 2.08)	0.82 (0.41 , 1.64)
American Indian/Alaskan Native/Native Hawaiian/Pacific Islander	0.92 (0.64 , 1.31)	1.13 (0.75 , 1.72)
Level of education of parent		
High school/GED or less	1.00 (-)	1.00 (-)
Some college/technical school	1.36 (1.02 , 1.80)**	0.90 (0.64 , 1.28)
College or higher	1.16 (0.85 , 1.58)	0.63 (0.43 , 0.94)**
Type of insurance		
Private only	1.00 (-)	1.00 (-)
Public only	0.90 (0.67 , 1.21)	2.10 (1.52 , 2.91))***
Multiple	1.08 (0.78 , 1.50)	1.77 (1.18 , 2.65)*
Uninsured	1.83 (0.64 , 5.25)	1.43 (0.48 , 4.28)
Non-financial Barriers		
Health status of parent		
Excellent	1.00 (-)	1.00 (-)
Fair/ poor	1.33 (1.06 , 1.68)**	1.10 (0.82 , 1.48)
No parent reported in household	1.03 (0.68 , 1.57)	1.19 (0.78 , 1.83)
Level of difficulty in obtaining care from mental health professional		
Not difficult	1.00 (-)	1.00 (-)
Somewhat/ very difficult	1.51 (1.09 , 2.09)**	0.88 (0.64 , 1.26)
Child did not need mental health care	1.21 (0.92 , 1.60)	1.05 (0.73 , 1.50)
Level of difficulty in obtaining a referral		
Not difficult	1.00 (-)	1.00 (-)
Somewhat/ very difficult	1.89 (1.25 , 2.86)	1.23 (0.76 , 1.97)
Child did not need a referral	0.77 (0.60 , 1.00)	0.85 (0.62 , 1.18)

Financial Barriers		
Out of pocket cost of health care		
Less than $999	1.00 (-)	1.00 (-)
$1000-$5000	1.14 (0.87, 1.49)	1.39 (0.91, 2.13)
More than $5000	0.74 (0.36 , 1.52)	1.09 (0.59 , 2.01)
Insurance benefits meet child's health needs		
Always/usually	1.00 (-)	1.00 (-)
Sometimes/ never	1.16 (0.74 , 1.83)	2.18 (1.11 , 4.30)*
Uninsured	0.34 (0.13 , 0.94)	1.37 (0.48 , 3.89)
Insurance plan covers needed mental health services		
Always/usually	1.00 (-)	1.00 (-)
Sometimes/ never	0.84 (0.60 , 1.19)	0.60 (0.36 , 1.00)
Uninsured	0.80 (0.62 , 1.03)	0.76 (0.52 , 1.10)

* p-value <0.05
** p-value <0.01
*** p-value <0.001

Figure 3: Two-way plot demonstrating adjusted odds ratio for school absenteeism due to non-financial barriers among children with autism/ADHD using the NSCH, 2016-2018.

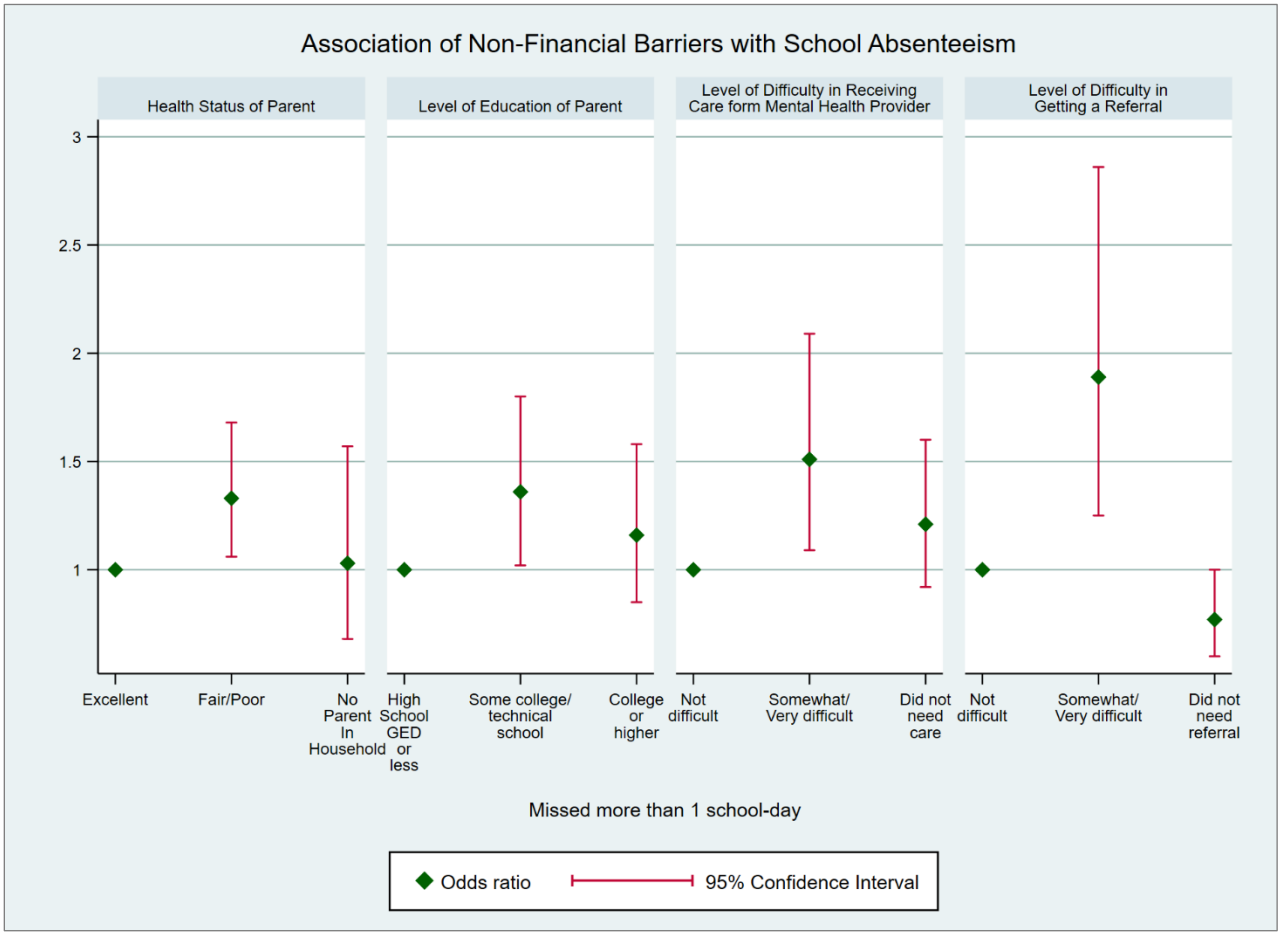
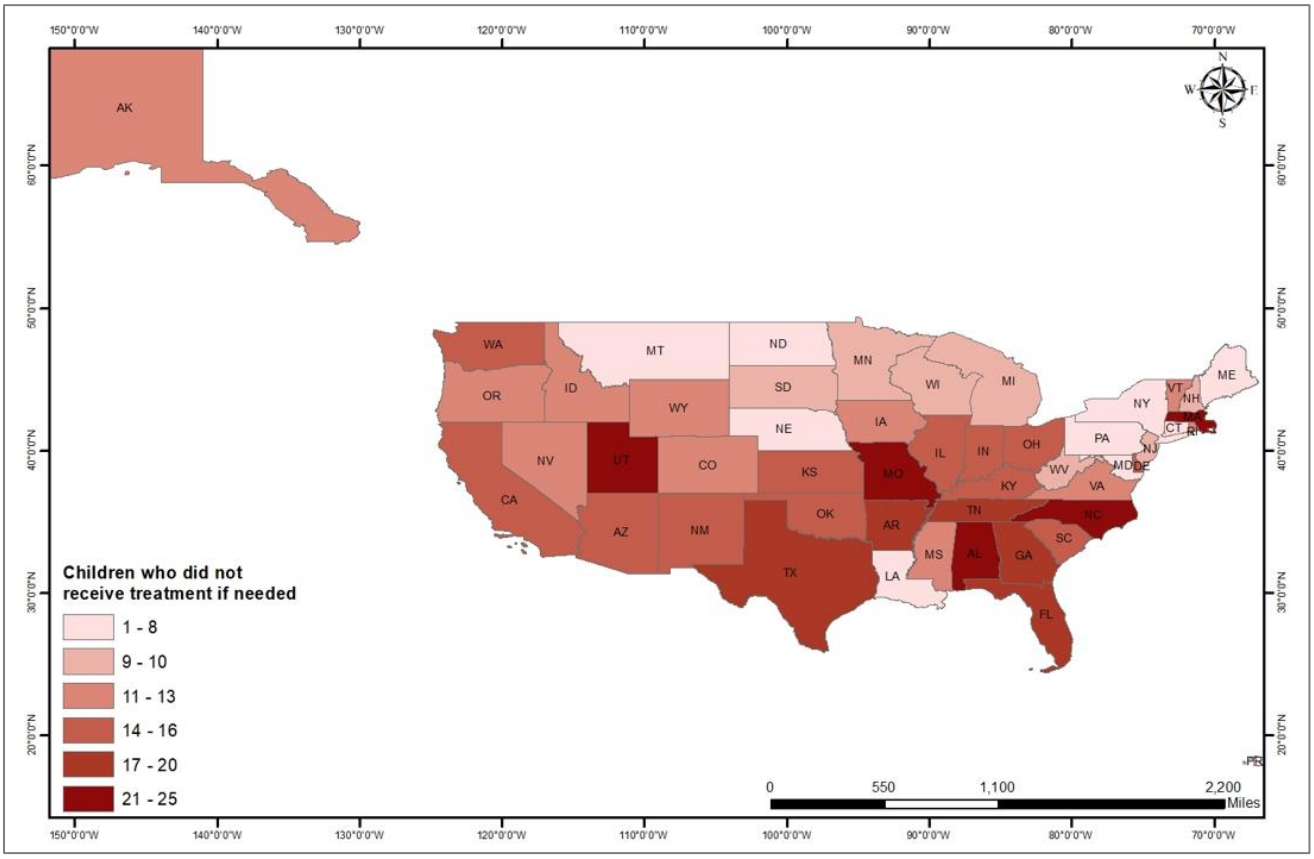


Figure 4: State-wise distribution of children who did not receive care from mental health providers using the NSCH, 2016-2018.



CHAPTER 4: IMPACT OF DISPARITIES ON MENTAL HEALTH SERVICE UTILIZATION AMONG THE ELDERLY WITH DEPRESSION/ANXIETY

ABSTRACT

Purpose: A major public health concern among the elderly is the prevalence of depression and anxiety estimated at 11.6% and 4.9% respectively. Older people with depression experience significant disability, impaired quality of life, increased mortality, and poor health outcomes without adequate mental health care. Older adults are less likely to recognize mental health problems and are more prone to multiple comorbidities. There is insufficient research about barriers to adequate mental health service utilization among the geriatric population. Besides, there is minimal evidence to suggest an association of compliant behaviors towards medical treatment. The objective of this study is to identify the disparities in mental health service utilization among elderly with self-reported depression or anxiety and describe the relationship of prescription medication adherence among elderly with mental illness and underlying chronic conditions.

Methods: National Health and Nutrition Examination Survey, 2015-2018, was used to identify 2,476 elderlies above 60 years of age with a current feeling of depression or anxiety. Outcome variables included mental health provider visits and utilization of prescription medication. Bivariate analysis using the Pearson Chi-square test and multivariable logistic regression was conducted. The data were weighted in survey data analysis to produce nationally representative results and post-regression analysis was performed to estimate the predicted probabilities.

Results: Less than 20% of Hispanics and non-Hispanic Asians took prescription medication for depression/anxiety. 10.1% of Hispanics were uninsured. More than 80% of the elderly across all races had an underlying chronic condition (Diabetes,

Hypertension, or Hypercholesterolemia). Non-Hispanic Asians were less likely to see a mental health provider (OR: 0.39, 95% CI: 0.17-0.91). Non-Hispanic Blacks, Hispanics, and non-Hispanic Asians were less likely to be compliant with prescription medicine for depression/anxiety. US citizens were more likely to demonstrate prescription medication compliance for mental illness (OR: 2.29, 95% CI: 1.14-4.6). The elderly adhering to prescription medication regimes for Hypertension or Hypercholesterolemia demonstrated compliant behavior for medication for mental illness.

Conclusions: Spreading awareness and reducing stigma is key to mitigate racial differences towards mental health care. Comprehensive policies and well-designed interventions are needed to help the elderly with low-income levels and poor social support. More strategies are needed to motivate prescription compliance behavior.

INTRODUCTION

The 12-month prevalence of depression and anxiety has been estimated at 18.4% and 11.2% respectively and has surfaced as a major public health concern among the elderly (CDC, 2021a). The Diagnostic and Statistical Manual-5 (DSM-5) outlines the criteria for depressive disorder as (i) depressed mood most of the day, every day, (ii) diminished interest in routine activities and ability to concentrate, (iii) significant unintentional weight loss, (iv) fatigue or loss of energy, (v) feelings of worthlessness, and (vi) recurrent thoughts of death or suicidal ideation (APA, 2013). The DSM-5 criteria for anxiety disorder include symptoms such as excessive worrying, fatigue, restlessness, impaired concentration, irritability, and difficulty sleeping (APA, 2013). Older people (above the age of 60 years) with depression experience significant disability including impaired quality of life, increased mortality, and poor health outcomes in the absence of suitable mental health care (Conner et al., 2010). Besides having high rates of

depression, these adults have high rates of completed suicide (Bartels, Blow, Brockmann, & Van Citters, 2005).

With the number of older adults expanding in the US, untreated/undertreated mental illness among this population is one of the most significant challenges facing the mental health care delivery system (US DHHS, 2003), especially because psychotherapy and psychopharmacology have been highly effective (Reynolds III et al., 2006). About 70% of the elderly with anxiety or depression do not obtain treatment (Byers, Arean, & Yaffe, 2012). Older adults are less likely to recognize mental health problems (Wetherell et al., 2009) and perceive a need for treatment (Mackenzie, Pagura, & Sareen, 2010). Furthermore, not everyone with a perceived need for treatment seeks/ receives help (Mackenzie et al., 2010). Plural barriers have been associated with such behavior as gender, race/ethnicity, health literacy, citizenship status, insurance, etc.

There are about 40 million immigrants in the US who face challenges such as separation from family, cultural and linguistic barriers, adjustment to a new environment, etc. (Derr, 2016). This becomes even more significant for elderly immigrants in the US who face such barriers in adjusting to a new culture and obtaining adequate healthcare which leads to a lower rate of formal health service use. Moreover, due to a lack of work history in the US, these elderly people are left with limited health insurance options. Literature showed that among the 1.1% of the uninsured elderly population in the US in 2000, 55.8% were foreign-born (Mold, J. W., Fryer, G. E., & Thomas, C. H., 2004). Some research demonstrated that type of health insurance is significantly associated with access and use of health services among older immigrants (Guendelman & Wagner, 2000; Kuo & Torres-Gil, 2001). Additionally, national reports in the early 2000s drew attention to disparities in the use of formal mental health services which

accelerated research on service use among underserved and vulnerable racial and ethnic communities (Smedly, Stith, & Nelson, 2003; US DHHS, 1999; US DHHS, 2003).

The impact of racism on health outcomes has gained traction among researchers in recent years. Racial discrimination within society and healthcare has prejudiced the perception towards healthcare providers, services, etc., which influences patient satisfaction, trust, perceived quality of healthcare interactions, and compliance with treatment (Williams & Mohammed, 2009). The elderly population among racial/ethnic minorities is rapidly expanding with almost 40% of the elderly population to be expected from a racial or ethnic minority by the year 2050 (US Census Bureau, 2002). Elderly with mental health concerns from racial/ethnic minorities have reported experiencing a 'triple stigma' which includes being old, mentally ill, and from an ethnic minority (SAMHSA, 2007). Also, gender disparity in health services utilization has been an established concern for the US healthcare system.

Older adults are more prone to have multiple comorbidities which are defined as the co-occurrence of two or more chronic illnesses without association to the primary condition (Valderas, Starfield, Sibbald, Salisbury, & Roland, 2009). As a consequence, mental illness in addition to underlying chronic conditions such as Diabetes Mellitus, Hypertension, or Hypercholesterolemia, pose a great burden on the health care systems and societies. Literature shows that the prevalence of depression increases with the number of chronic conditions (Gunn et al., 2012).

Hypertension is a prevalent and often asymptomatic chronic disease that affects approximately 70 million adults in the US (Chobanian et al., 2003). Because both hypertension and anxiety present significant public health challenges, the association between the two conditions has recently attracted attention. Some studies suggest that individuals with anxiety have a higher risk of hypertension than those without anxiety

(Ginty, Carroll, Roseboom, Phillips, & De Rooij, 2013; Stein et al., 2014). Also, some studies suggest that hypertensive patients have a higher risk of anxiety than those without hypertension (Hamer, Batty, Stamatakis, & Kivimaki, 2010). Non-compliance is a common concern among this population with estimates ranging from 40% to 75% (Pampallona, Bollini, Tibaldi, Kupelnick, & Munizza, 2002). A meta-analysis affirmed that depressed patients were three times more likely than non-depressed patients to be non-compliant to medical treatment including prescription medications, diet, lifestyle, and behavior changes (DiMatteo, Giordani, Lepper, & Croghan, 2002). Depression has been associated with a lower rate of medication adherence especially among those with chronic illnesses (Carney, Freedland, Eisen, Rich, & Jaffe, 1995; Wang et al., 2002). Some studies have shown milder symptoms of depression to be associated with lower compliance in self-management of chronic diseases such as diabetes (Gonzalez et al., 2007).

There is not enough research about the specific barriers to adequate mental health service utilization among the geriatric population who feel depressed or anxious in recent times. Besides, no recent study using national-level data has described a relationship between compliance for medical treatment for underlying multiple chronic illnesses and mental health issues. This study fills this gap in the literature by providing comprehensive information on the relationship between the use of mental health services and factors such as gender and racial disparity, education level, immigrant status, type of insurance, presence of underlying chronic illness, and prescription medicine compliance.

The objectives of this study were to (i) identify the disparities and barriers in mental health service utilization among elderly populations with self-reported depression or anxiety, and (ii) describe the relationship of prescription medication adherence among

patients with mental illness and underlying chronic conditions. Understanding these factors will help researchers, clinicians, and policymakers to develop strategies to improve health care use and delivery.

METHODS

Data source & Applicable Study Population

The National Health and Nutrition Examination Survey (NHANES) 2015-2018 data were used for the analysis where individuals of all ages in households across the US are randomly selected to participate annually (Chen, T., Clark, Riddles, Mohadjer, & Fakhouri, 2020). The survey data includes demographic, socioeconomic status, dietary, and health-related questions, medical and dental examination, physiological measurements, and laboratory tests. Participating individuals were interviewed in their homes via Computer Assisted Personal Interview (CAPI) and Audio computer-assisted personal self-interview (ACASI) with a follow-up physical examination conducted in a Mobile Examination Center (MEC). The study team consisted of a physician, medical and health technicians, dietary and health interviewers, many of which were bilingual (English/Spanish). The National Center for Health Statistics (NCHS) Research Ethics Review Board (ERB) approved all data-collection procedures.

The data consisted of survey responses from 2015-2016 (n=9,971) and 2017-2018 (n=9,254) data cycles. The inclusion criteria for this study were participants of age 60 and above with a current sense/feeling of depression or anxiety. The survey questions to identify participants were (i) ‘Over the last 2 weeks, how often have you been bothered by the following problems: feeling down, depressed, or hopeless?’ and (ii) ‘How often do you feel worried, nervous, or anxious? Would you say daily, weekly,

monthly, a few times a year, or never?'. Among the 2,849 survey respondents, missing values (13.1%) were removed, and the final study population consisted of 2,476 participants.

Dependent variables

Mental health service utilization among the elderly was measured using two parameters (i) Seen a mental health provider: The participant was asked 'During the past 12 months, have you seen or talked to a mental health professional such as a psychologist, psychiatrist, psychiatric nurse or clinical social worker about your health?'. The responses were categorized as yes and no. (ii) Taking prescription medication for mental health condition: Responses to two interview questions were combined to derive this variable 'Do you take medication for depression?' or 'Do you take medication for these feelings (worried, nervous or anxious)?'. The responses were coded into binary categories of yes and no.

Independent variables

The primary independent variables included (i) race/ethnicity (non-Hispanic white, non-Hispanic Black, Hispanic, non-Hispanic Asian, and other [including multi-racial]), (ii) US citizenship status (no/yes): the participants who were citizens by birth or by naturalization were grouped as US citizens, and (iii) primary language (Spanish/English): this variable indicates the language used during the in-person questionnaire interview conducted at the participant's home.

Other explanatory variables included (i) level of education (less than high school, high school/GED, some college/AA degree, and a college graduate or higher), (ii) the usual place to obtain health care (doctor's office/HMO, clinic/health center, hospital ER/outpatient, other, and no place for health care), and (iii) insurance status: (private, Medicare/Medigap, Medicaid, other, and uninsured). The other category included insurance coverage under CHIP (Children's Health Insurance Program), military health care, state-sponsored health plan, other government insurance, or state service plan.

The explanatory variables for underlying chronic illness included (i) Diagnosis of an underlying chronic condition: responses to three questions were combined to estimate the presence of chronic conditions 'did a doctor ever tell that you have diabetes?', 'did a doctor ever tell that you have high blood pressure?', and 'did a doctor ever tell that you have high cholesterol?'. The responses were categorized as yes and no (ii) Medication adherence for diabetes: two questions were asked to measure compliance for medication for diabetes 'are you taking insulin to lower blood sugar' and 'are you taking diabetic pills to lower blood sugar' if they had a current diagnosis of diabetes. The responses were coded as no and yes.

(iii) Medication adherence for hypertension: the participant was asked 'are you now taking prescribed medication for high blood pressure?' if they had a current diagnosis of high blood pressure which was coded as no and yes, and (iv) Medication adherence for hypercholesterolemia: the participant was asked 'are you now taking prescribed medication to lower cholesterol?' if they had a current diagnosis of high cholesterol which was coded as no and yes. The correlation of compliance with chronic condition prescription medication was examined with mental health care utilization among this population to better understand the association between health behavior towards general health services and mental health service utilization.

In addition, demographic and socio-economic variables included age (60-69 years, above 70 years), gender, and marital status (never married, married, living with a partner, widowed/divorced/ separated).

Analysis

We present descriptive summary statistics for each variable among the total study population and stratified by race/ethnicity. Bivariate analysis was performed using the Pearson Chi-square test, to examine the differences in each variable across all racial/ethnic categories. Multivariable logistic regression was used to examine the association between race/ethnicity with mental health service utilization after adjusting for all other explanatory variables. For multivariable logistic regression, we employed two models. In Model (1), we adjusted citizenship without any interaction term. In Model (2), we analyzed two separate models in which we adjusted the interaction term between language and citizenship (Model 2a), and race/ethnicity and citizenship (Model 2b), respectively. To improve the interpretability of interaction terms in the non-linear model (i.e., difference-in-difference [DiD] in the logistic model), we converted estimates to average marginal effects (AME) (differences in adjusted predicted outcome between comparison and reference group) and derived the difference between non-citizens and citizens (Stata Corp, n.d.).

All estimates were adjusted with probability weights, primary sampling unit, and strata in survey data analysis to produce nationally representative individual-level outcomes. Appropriate weights were selected, and average weights were constructed for four years (2 data cycles) to report multiyear population estimates (NHANES, 2018). The p-values were calculated using a significance level of 0.05. The University of

Nebraska Medical Center (UNMC) Institutional Review Board (IRB) review was waived as the participant information was de-identified in the public use file. The data were analyzed, and two-way plots were created using STATA MP v 16.1.

RESULTS

A population of 2,476 elderly people with self-reported depression or anxiety was included in the data analysis. The descriptive summary statistics for demographic and socio-economic factors were presented among the total study population and stratified by race/ethnicity in Table 6. The table displays the unadjusted frequencies and adjusted percentages. 25% of the total population took prescription medication for feelings of depression or anxiety, 58.6% were females, 96.0% were US citizens and English speakers, and 61.7% had an education level of college and above. 26.9% of non-Hispanic White, 17.2% of non-Hispanic Black, 19.5% Hispanics, and 6.2% non-Hispanic Asians were taking prescription medication for depression/anxiety ($p<0.01$). 65.7% non-Hispanic White, 59.4% non-Hispanic Asians, and 61.3% of the elderly from other races (multiracial) had an educational level of college and above.

The descriptive summary statistics for health care access variables and prescription medicine adherence behavior were presented among the total study population and stratified by race/ethnicity in Table 7. The majority of the participants from all races had their doctor's office/HMO as their usual place for obtaining health care. However, 7% non-Hispanic Blacks and 8.5% of Hispanics had no usual place to obtain health care ($p<0.01$). 10.1% of elderly Hispanics were uninsured. 74.7% non-Hispanic White, 82.5% non-Hispanic Black, 79.2% Hispanics, 75.5% non-Hispanic Asians, and 90.4% of elderly from other/multi races had a diagnosis of an underlying chronic condition such as diabetes, hypertension, or hypercholesterolemia ($p<0.01$).

18.8% non-Hispanic White, 27% non-Hispanic Black, 30.5% Hispanics, and 31.4% non-Hispanic Asians were compliant with prescribed oral medicine/insulin for a diagnosis of diabetes ($p<0.01$). 51% non-Hispanic White, 68.9% non-Hispanic Black, 55.8% Hispanics, and 54.1% non-Hispanic Asians were compliant with prescribed medicine for a diagnosis of hypertension ($p<0.01$).

The descriptive summary statistics for outcome variables were presented among the total study population and stratified by race/ethnicity in Table 8. Among the total study population, 8.5% visited mental health care providers and 25.0% took prescription medicine during the last 12 months. 3.7% and 6.2% of the non-Hispanic Asians visited mental health providers and took prescription medicine for depression or anxiety, respectively.

The association of demographic and socio-economic factors with mental health service utilization (visiting a mental health provider and taking prescription medication for depression or anxiety) in multivariable logistic regression analysis is presented in Table 9. People aged 70 and above were less likely to see a mental health provider (odds ratio [OR]: 0.53, 95% confidence interval [CI]: 0.35-0.81). Females were more likely than males to be compliant with prescription medication for self-reported depression or anxiety (OR: 2.17, 95% CI: 1.63-2.89). In comparison to non-Hispanic whites, non-Hispanic Asians were less likely to see a mental health provider (OR: 0.39, 95% CI: 0.17-0.91). Non-Hispanic blacks (OR: 0.42, 95% CI: 0.29-0.61), Hispanics (OR: 0.38, 95% CI: 0.24-0.61), and non-Hispanic Asians (OR: 0.16, 95% CI: 0.08-0.32) were less likely to be compliant with prescription medicine for depression or anxiety. In comparison to non-US citizens, the US citizens were more likely to be compliant with prescription medication for a mental health condition (OR: 2.29, 95% CI: 1.14-4.6). People who had

an education level of college and above were more likely to see a mental health provider than those with education less than high school (OR: 2, 95% CI: 1.16-3.46).

The association for socioeconomic indicators and health practices/behaviors with mental health care utilization in a multivariable logistic regression analysis is displayed in Table 9. The elderly with hospital ER/outpatient as their usual place to obtain health care were more likely to see a mental health provider than those who usually obtain care at a doctor's office/HMO (OR: 5.4, 95% CI: 2.57-11.36). People with no usual source to obtain health care were less likely to see a mental health provider (OR: 0.23, 95% CI: 0.08-0.64), and less likely to be compliant with prescription medication for mental illness (OR: 0.42, 95% CI: 0.19-0.93). The elderly with Medicaid insurance were more likely to see a mental health provider (OR: 3.04, 95% CI: 1.48-6.26), and more likely to be compliant with prescription medication for mental illness (OR: 1.77, 95% CI: 1.07-2.9). People who were compliant with prescription medicine for underlying hypertension (OR: 1.59, 95% CI: 1.07-2.35) or hypercholesterolemia (OR: 1.75, 95% CI: 1.18-2.61) were more likely to be compliant with prescription medicine for mental illness as well. Figure 5 shows a two-way plot that demonstrates the association of race and prescription medicine compliance behavior with mental health service utilization.

The DiD estimates from Model 2 are presented in Appendix C. For example, in the estimation Model 2a, columns (1) and (2) show AME of English language on mental health provider visit among non-US citizens and US citizens, respectively. Column (3) shows a difference in the AME of the English language on mental health provider visits between non-US citizens and US citizens. The difference in the association of the English language with seeing a mental health provider between non-citizens and citizens is 0.01. Similarly, the difference in the association of the English language with taking

prescription medicine between non-citizens and citizens is 0.08 The three DiD models did not show any statistically significant results.

DISCUSSION

This study presents new estimates to understand the barriers to adequate mental health care utilization among the geriatric population with self-reported depression or anxiety. Some of the key findings include (i) non-Hispanic Asian elderly are less likely to see a mental health provider after feeling depressed or anxious, (ii) Non-Hispanic Blacks, Hispanics, and non-Hispanic Asians are less likely to be compliant with prescription medicine for depression or anxiety, (iii) elderly with an education level of college and above are more likely to see a mental health provider, (iv) elderly insured under Medicaid are more likely to see a mental health provider and be compliant with prescription medication for mental illness, and (v) elderly who are compliant with prescription medicine for underlying chronic conditions (hypertension and hypercholesterolemia) are more likely to be compliant with prescription medicine for mental illness as well (depression or anxiety).

(i) Race/ethnicity: A considerable number of studies during the 1990s identified racial/ethnic disparities in the diagnosis and treatment of depression, among both the general adult and the elderly population (Crystal, Sambamoorthi, Walkup, & Akıncıgil, 2003; Strothers III et al., 2005). In recent studies, the nonelderly and elderly adult populations are often combined rather than providing findings for these groups separately. Previous literature suggests that disparity in mental health treatment worsened since the early 2000s with evidence showing that the elderly with depression from minority groups receive less mental health care in comparison to non-Hispanic Whites (Cook, McGuire, & Miranda, 2007; Sclar, Robison, & Skaer, 2008; Stockdale,

Lagomasino, Siddique, McGuire, & Miranda, 2008). In contrast, one national-level study reported an average increase in treatment rates in the 2000s, with a significant increase in treatment rates among African Americans, possibly narrowing the racial/ethnic gap among adults in general (Marcus & Olfson, 2010). The Institute of Medicine (2003) defined these disparities among minorities to receive a depression diagnosis and be treated for the same.

Multiple reasons exist for the racial/ethnic gaps such as differences in depression help-seeking patterns, differences in access to health care, stigma, patient attitudes, and knowledge, etc. (Conner et al., 2010). A study showed that in comparison to non-Hispanic Whites, African Americans were more likely to believe that mental health problems would improve on their own (Anglin, Alberti, Link, & Phelan, 2008). Another study suggested that African Americans and Hispanics were more likely to seek depression care from nonmedical providers such as pastors or lay counselors (Woodward, A. T. et al., 2009). The gap in rates of diagnosis of depression could also result from racial/ethnic differences in the patient-physician relationship and communication barriers during the clinical encounter (Lin et al., 2003). Moreover, geographic barriers to availability and access to mental health services could be a significant reason for disparities as well (McGuire, T. G. & Miranda, 2008).

Research shows that constant discrimination takes a toll on one's mental health (Kessler, Mickelson, & Williams, 1999). Stereotypes based on past experiences influence patients' behavior profoundly and increases physicians' bias through the reinforcement of racial/ethnic stereotypes (van Ryn et al., 2011). Contrary to the experience of racism to limit the access to formal mental health care, racism may indirectly present with an increased need for healthcare due to its negative impacts on physical and mental health (Richman, Kohn-Wood, & Williams, 2007; Richman &

Lattanner, 2014). The level of formal education could also contribute to influencing the attitudes of the elderly towards mental health services among ethnic minority groups (Rivera, 2002). We found non-Hispanic Asians to be less likely to see a mental health provider after feeling depressed or anxious. In addition, Non-Hispanic Blacks, Hispanics, and non-Hispanic Asians were less likely to be compliant with prescription medicine for depression or anxiety. Also, the elderly with an education level of college and above were more likely to seek treatment from a mental health provider.

(ii) Citizenship status: Some studies suggest that compared to US-born people, the immigrant population has uncommon patterns of help-seeking behavior and receive a dissimilar quality of care from mental health service providers (Abe-Kim et al., 2007; US DHHS, 2001). These distinct problems could result from the English language proficiency, stress associated with migration from home country, new culture, way of living, etc. Citizenship status has turned into an important factor for mental health service utilization research after policies for eligibility for federal benefits were linked with it. However, there is meager evidence to describe the relationship between citizenship status and mental health service use. Previous studies show that in comparison to native citizens, the non-citizens were highly unlikely to have a regular source of healthcare and about half as likely to visit a healthcare or specialty mental health professional (Ku & Matani, 2001; Lee & Choi, 2009; Lee & Matejkowski, 2012). These findings could be attributed to a lack of insurance among non-citizens, a desire to keep such experiences private, and cultural beliefs and values around mental health. Similar to previous literature, we found citizens to be more compliant with prescription medication for mental illness in comparison to non-citizens.

(iii) Stigma: According to Cooper et al. (2003), an inverse relationship exists between stigma and treatment-seeking behavior and is more prevalent among older

adults. Individuals who perceive society as holding stigmatizing beliefs about mental illness and those who internalize stigma are less likely to seek mental health treatment (Leaf, Bruce, Tischler, & Holzer III, 1987; Sirey et al., 2001). Katona and Livingston (2000) identified the stigma of mental illness as the most crucial factor for older adults not seeking mental health services. The Surgeon General's report on mental health highlighted stigma as a hurdle to seek care among the elderly (US DHHS, 1999). Traditional beliefs have been described as a barrier to formal mental health care; for example, Iranian immigrants displayed an attitude that 'only crazy people seek mental health care' and advocate for a more holistic approach that includes the spirit, hence rendering physicians' attempts to focus on prescribing medication ineffective (Martin, 2009). Despite the prevalence of the idea that cultural factors are important barriers to mental health care, studies have not shown enough notice of such barriers (Abe-Kim et al., 2007; Bauer, Chen, & Alegria, 2010).

One of the common beliefs among non-Hispanic Asians is that good mental health can be achieved through willpower and by avoiding bad thoughts (Stewart, 1995). Asian cultures often link mental illnesses to supernatural causes, such as a punishment by God or ancestors for immoral behavior, inappropriate location of an ancestor's tomb or living houses, or possession by evil spirits (Chong et al., 2007). Because of such beliefs, people rely on themselves and family members to deal with the problem or turn to spiritual healers for help. Stigma, shame, and loss of face associated with mental illness among Asian cultures prevent individuals and their families from seeking formal mental health care which leads to delay in treatment. The Western healthcare system relies on intimate communication with mental health providers such as a psychiatrist, psychologists, counselors, etc., which is against the traditional Asian culture, values, and beliefs of not talking about personal emotions or family matters with strangers/outsiders.

Consistent with the literature, we found non-Hispanic Asians to be less likely to see a mental health provider and less compliant with prescription medication for mental health illnesses.

(iv) Health insurance: Lack of adequate health insurance has emerged as one of the major structural barriers to health service use among older immigrants (Angel, Angel, & Markides, 2002). Having a reliable source of payment for care serves as a facilitator in seeking health care (Xu & Borders, 2008). This indirect relationship represents inequitable access to health care which is not limited to immigrants only (Andersen, Ronald M., 1995). About 7% of the US-born elderly and 31% of the foreign-born elderly in the US were uninsured in 2018 (US Census Bureau, 2020a). The Institute of Medicine estimated that inadequate health insurance in the US costs between $65 and $130 billion per year due to the health impairment and years of potential life lost among all uninsured individuals (Ku, 2006). We found that the elderly who were insured under Medicaid were more likely to see a mental health provider and be compliant with prescription medication for mental illness.

(v) Presence of underlying chronic conditions: Chronic diseases have adverse effects on the quality of life and act as precursors to anxiety and depression. Evidence suggests that people with anxiety and depression need more attention due to increased morbidity and mortality (Landman et al., 2010). Research has demonstrated that inadequate health literacy among the elderly is associated with poor health and a higher risk of hypertension, diabetes mellitus, heart failure, and arthritis (Wolf, Gazmararian, & Baker, 2005). Hypertension is one of the most common diseases worldwide and has been identified as the leading cause of mortality and the third cause of disability-adjusted life years (DALY) worldwide (WHO, 2009). According to a report by Kearney et al. (2005), the total number of adults with hypertension in 2025 is predicted to increase to

1.56 billion worldwide. Thereby, recognizing the modifiable risk factors of hypertension is vital for public health and clinical medicine.

Several studies have described the association of hypertension with mental illnesses with some investigators suggesting an association of anxiety and hypertension (Bacon, Campbell, Arsenault, & Lavoie, 2014; Hamer et al., 2010; Stein et al., 2014) and some suggesting the opposite (Wiltink et al., 2011). Moreover, some studies reported a decrease in blood pressure with anxiety symptoms (Hildrum, Romild, & Holmen, 2011). Anxiety and depression have been closely linked with an increased risk of hypertension in depressed patients and an increased risk of depression in hypertensive patients (Scalco, Scalco, Azul, & Lotufo Neto, 2005; Stein & Gureje, 2004). However, little is known about the relationship between anxiety and depression and adherence to prescription medication for hypertension among older adults. More than 70% of our total study population had a diagnosis of underlying comorbidity such as diabetes, hypertension, or hypercholesterolemia.

(vi) Prescription medication adherence: Low prescription medication adherence is common and associated with higher health care costs especially among the elderly who are more prone to have multiple chronic conditions with complicated medication regimes (Bosworth, Oddone, & Weinberger, 2006; Col, Fanale, & Kronholm, 1990; Morisky, Green, & Levine, 1986; Murray & Callahan, 2003). Besides, the elderly are more susceptible to not understanding instructions properly due to age-related cognitive changes and declining memory (Murray et al., 2004). These barriers have been emphasized for low adherence and consequent hospitalizations (Col et al., 1990). Research suggests that forgetfulness including retrospective memory failure (forgetting what they have been told about medications and whether they took their medications) and prospective memory failure (forgetting to take their medications) is a common cause

of poor medication compliance (Stoehr et al., 2008). Specific interventions such as regular reminders, positive reinforcement of stable behavior, use of family and social support, and electronic monitoring devices are essential to address this concern (Bosworth et al., 2006).

Providers can help by simplifying complex medical regimens (e.g., using once-daily dosing when possible) and discontinuing unnecessary medications. Some studies have described depressive symptoms as a crucial factor for medication adherence among patients with underlying chronic diseases (Wang et al., 2002). Older adults with poor emotional wellbeing may also have lower adherence to antihypertensive medications (Holt, Muntner, Joyce, Webber, & Krousel-Wood, 2010). Evidence exists to suggest that clinicians under-diagnose mood disorders in African Americans, and they are less likely to be treated for depression in the primary care setting due to racial differences in medication adherence (Stockdale et al., 2008). We found a positive relationship between compliance with prescription medication for chronic diseases (hypertension and hypercholesterolemia) and adherence to prescription medication for depression or anxiety.

Mental illness has been associated with diverse consequences such as low self-esteem, lack of education/employment opportunities, limited economic development and deprived social network, and status within the community (Morgan, Burns, Fitzpatrick, Pinfold, & Priebe, 2007; Myers, A. & Rosen, 1999). Studies have shown that in comparison to males, females have a higher rate of mental health service utilization often explained by the cultural values and expectations associated with females or by the specific roles upheld by both genders (Vasiliadis, Gagné, Jozwiak, & Préville, 2013).

Lack of a partner in some subjects may have led to decreased adherence. In one study, greater social support was found to be associated with increased treatment

adherence in older patients with depression (Voils, Steffens, Bosworth, & Flint, 2005). Our results showed that the elderly without a usual place to obtain health care were less likely to see a mental health provider or use prescription medication for mental illness. This could be explained by low health literacy, poor neighborhood, low-income levels, etc. Focusing on spreading education and awareness among these underserved populations plays a vital role in adopting health-promoting behaviors. Also, health providers need to know the current laws and their effect on elderly immigrants and their families to help determine their eligibility for public insurance plans and suggest low-cost alternatives.

Efforts are warranted to address the cultural and social barriers to mental health service utilization. Communities need to be explained the nature of mental illness and the advantages of receiving appropriate treatment. Educational programs that focus on the causes of mental illnesses and treatment are needed at a larger scale to rectify the misconceptions and promote the utilization of mental health services. Attention needs to be paid towards reducing the stigma and traditional beliefs toward mental illnesses. Health professionals treating patients from diverse racial backgrounds should be encouraged to develop and promote culturally sensitive and language appropriate materials. Patients and their families need to be assured that mental health professionals maintain confidentiality and educated to obtain early treatment to ensure better management of any mental illness (Wynaden et al., 2005). Since ethnic minorities tend to seek help from primary care physicians for mental health-related problems, mental health professionals should work in collaboration with primary care providers and traditional medicine practitioners. This would facilitate more culturally sensitive health services and increase the potential for early interventions, diagnosis, and treatment.

Limitations

We encountered some limitations in this study. The NHANES survey collection methodology had a higher non-response bias in data cycle 2017-2018 which required additional weight adjustments compared to previous data cycles. Adjusting some variables such as education, race, gender, and age groups, reduced non-response bias significantly which resulted in an increase in variance for some survey estimates. However, enhanced weight adjustments reduced the variance. According to the analytic guidelines (2018), the Hispanic category included all people who reported Hispanic ethnicity regardless of race. The non-Hispanic Black category included all people who reported as non-Hispanic Black (single race or in combination with any other race including Asian). The non-Hispanic-non-Black Asians (single race or combination with another race except Black) included all persons having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent, including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam. All other individuals were assigned to the non-Hispanic White and Other category. Therefore, any Asian person who also identified as Hispanic or non-Hispanic Black as well was considered to be in the respective latter categories. However, in the public use data, the race and Hispanic origin of each sampled person was categorized to include all races reported as well as Hispanic origin.

The survey responses were based on the patient's self-reported diagnosis and adherence to medications rather than medical records data. Based on the procedure manual, to avoid misinformation, the interviewer recorded information from the product/ medicine container label into CAPI after arranging them into categories such as dietary supplements, nonprescription antacids, and prescription medications (NHANES, 2020).

CONCLUSION

Comprehensive policies and well-designed interventions are needed to help vulnerable populations such as the elderly with low-income levels and poor social support. Health care providers should adopt a culturally sensitive, patient-centered approach to identify and address the barriers to adequate compliance which would translate into better management of chronic diseases and reduce disparities.

Table 6: Descriptive characteristics for the demographic and socio-economic status stratified by race/ethnicity using the NHANES, 2015-2018

	Total Sample	**Race/Ethnicity**					
	(n=2,476) n (%)	Non-Hispanic White (n=1,085) n (%)	Non-Hispanic Black (n=517) n (%)	Hispanic (n=613) n (%)	Non-Hispanic Asian (n=179) n (%)	Other (n=82) n (%)	P-value
Age category							0.05
60-69 years	1,288 (54.0)	388 (52.4)	336 (62.1)	413 (59.3)	108 (56.6)	43 (56.7)	-
above 70 years	1188 (46.0)	697 (47.6)	181 (37.9)	200 (40.7)	71 (43.4)	39 (43.3)	-
Sex							0.19
Male	1,128 (41.4)	523 (42.2)	253 (38.8)	246 (37.1)	65 (33.9)	41 (48)	-
Female	1348 (58.6)	562 (57.8)	264 (61.2)	367 (62.9)	114 (66.1)	41 (52)	-
Marital status							<0.001
Never married	147 (4.3)	38 (3.3)	66 (13.2)	31 (5.7)	8 (5)	4 (2.3)	-
Married	1309 (59.1)	601 (61.6)	189 (33.9)	347 (54.5)	131 (70.3)	41 (63.5)	-
Living with partner	90 (3.2)	34 (3)	27 (4.3)	26 (4.6)	0 (0)	3 (3.9)	-
Widowed/divorced/separated	930 (33.4)	412 (32.1)	235 (48.6)	209 (35.2)	40 (24.7)	34 (30.3)	-
Race/Ethnicity							<0.001
Non-Hispanic White	1085 (77.2)	1085 (100)	-	-	-	-	-
Non-Hispanic Black	517 (8.2)	-	517 (100)	-	-	-	-
Hispanic	613 (8.2)	-	-	613 (100)	-	-	-
Non-Hispanic Asian	179 (3.3)	-	-	-	179 (100)	-	-
Other	82 (3.1)	-	-	-	-	82 (100)	-
Citizenship status							<0.001
Not a US citizen	190 (3.1)	11 (0.7)	10 (1.8)	135 (21)	34 (20.2)	0 (0)	-
US citizen	2286 (96.9)	1074 (99.3)	507 (98.2)	478 (79)	145 (79.8)	82 (100)	-
Primary Language (used in the interview)							<0.001
Spanish	318 (3.9)	0 (0)	0 (0.3)	317 (47.7)	0 (0)	0 (0)	-

English	2,158 (96.1)	1,085 (100)	517 (99.7)	296 (52.3)	179 (100)	82 (100)	-
Level of education							<0.001
Less than high school	629 (12.6)	145 (7.8)	116 (21.7)	319 (46.6)	39 (24.5)	10 (6.2)	-
High school/GED or less	586 (25.7)	306 (26.6)	127 (26.6)	102 (18.2)	26 (16.2)	25 (32.6)	-
Some college/AA degree	737 (30.0)	358 (30.3)	174 (32.7)	135 (24.7)	37 (21.2)	33 (39.3)	-
College graduate or above	524 (31.7)	276 (35.4)	100 (18.9)	57 (10.5)	77 (38.2)	14 (22)	-

* the 'n' shows unadjusted frequencies for each variable

* the % depicts adjusted probabilities

Table 7: Descriptive characteristics for the mental healthcare access and prescription medication adherence stratified by race/ethnicity using the NHANES, 2015-2018

	Total Sample	**Race/Ethnicity**					
	(n=2,476) n (%)	Non-Hispanic White (n=1,085) n (%)	Non-Hispanic Black (n=517) n (%)	Hispanic (n=613) n (%)	Non-Hispanic Asian (n=179) n (%)	Other (n=82) n (%)	P-value
Usual place for health care							<0.001
Doctors' office/HMO	1517 (70.6)	765 (74.6)	320 (63.6)	265 (46.5)	119 (67.1)	48 (55.1)	-
Clinic/health center	631 (19.7)	213 (17.3)	116 (21.9)	242 (37)	45 (27.3)	15 (21.8)	-
Hospital ER/outpatient	140 (4.0)	43 (3.3)	41 (6.7)	40 (7.1)	6 (1.9)	10 (9.7)	-
Other	37 (1.5)	20 (1.3)	4 (0.8)	7 (0.9)	1 (0.5)	5 (8.4)	-
No place for healthcare	151 (4.2)	44 (3.5)	36 (7)	59 (8.5)	8 (3.2)	4 (5.1)	-
Type of insurance							<0.001
Private	341 (16.8)	110 (17.3)	82 (15.8)	102 (16.2)	43 (20)	4 (4.2)	-
Medicare/Medi-gap	1059 (43.3)	571 (45.1)	201 (39.3)	197 (34.4)	60 (37.4)	30 (39.2)	-
Medicaid	319 (6.7)	52 (3.4)	83 (15.7)	138 (21.9)	33 (20.4)	13 (10.1)	-
Other	593 (29.1)	312 (31)	113 (22.1)	104 (17.4)	32 (16.3)	32 (44.2)	-
Uninsured	164 (4.1)	40 (3.2)	38 (7.1)	72 (10.1)	11 (6)	3 (2.3)	-
Underlying chronic condition (Diabetes/Hypertension/Hypercholesterolemia)							<0.001
No	505 (23.8)	238 (25.3)	88 (17.5)	126 (20.8)	44 (24.5)	9 (9.6)	-
Yes	1971 (76.2)	847 (74.7)	429 (82.5)	487 (79.2)	135 (75.5)	73 (90.4)	-
Prescription medicine for Diabetes							<0.001
No	1836 (78.6)	864 (81.2)	373 (73)	423 (69.5)	121 (68.6)	55 (64.8)	-
Yes	640 (21.4)	221 (18.8)	144 (27)	190 (30.5)	58 (31.4)	27 (35.2)	-
Prescription medicine for Hypertension							<0.001

No	1043 (46.3)	496 (49)	160 (31.1)	279 (44.2)	84 (45.9)	24 (25.6)	-
Yes	1433 (53.7)	589 (51)	357 (68.9)	334 (55.8)	95 (54.1)	58 (74.4)	-
Prescription medicine for Hypercholesterolemia							0.14
No	1408 (56.4)	604 (56.4)	308 (59.9)	351 (56.9)	101 (55.6)	44 (44.4)	-
Yes	1068 (43.6)	481 (43.6)	209 (40.1)	262 (43.1)	78 (44.4)	38 (55.6)	-

* the 'n' shows unadjusted frequencies for each variable

* the % depicts adjusted probabilities

Table 8: Descriptive characteristics for mental health service utilization stratified by race/ethnicity using the NHANES, 2015-2018

	Total Sample	**Race/ Ethnicity**					
	(n=2,476) n (%)	Non-Hispanic White (n=1,085) n (%)	Non-Hispanic Black (n=517) n (%)	Hispanic (n=613) n (%)	Non-Hispanic Asian (n=179) n (%)	Other (n=82) n (%)	P-value
Mental health provider visit							0.21
No	2,238 (91.5)	992 (91.9)	460 (90)	549 (89.8)	170 (96.3)	67 (86.2)	-
Yes	238 (8.5)	93 (8.1)	57 (10)	64 (10.2)	9 (3.7)	15 (13.8)	-
Taking prescription medicine for Depression/ Anxiety							<0.001
No	1,952 (75.0)	810 (73.1)	436 (82.8)	488 (80.5)	165 (93.8)	53 (67)	-
Yes	524 (25.0)	275 (26.9)	81 (17.2)	125 (19.5)	14 (6.2)	29 (33)	-

* the 'n' shows unadjusted frequencies for each variable
* the % depicts adjusted probabilities

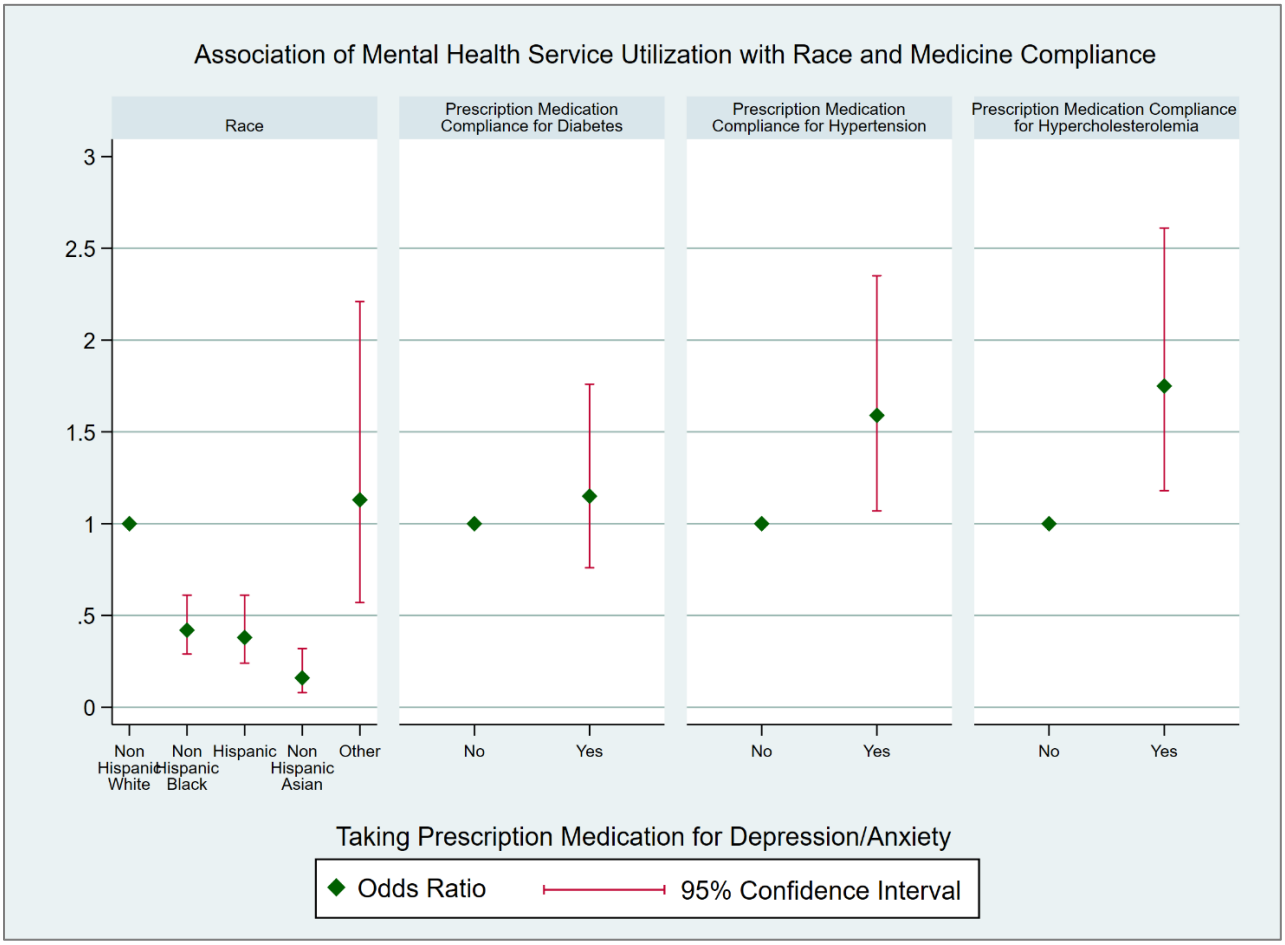
Table 9 Association of demographic, socio-economic characteristics, and health behavior with mental health service utilization using the NHANES, 2015-2018

	Mental health provider visit	**Taking prescription medicine for Depression/Anxiety**
	OR (95% CI)	OR (95% CI)
Age category		
60-69 years	1.00 (-)	1.00 (-)
above 70 years	0.53 (0.35, 0.81)**	0.69 (0.46, 1.03)
Sex		
Male	1.00 (-)	1.00 (-)
Female	1 (0.61,1.64)	2.17 (1.63, 2.89)***
Marital status		
Never married	1.00 (-)	1.00 (-)
Married	1.27 (0.5, 3.24)	0.75 (0.39, 1.44)
Living with partner	0.87 (0.3, 2.54)	0.73 (0.3, 1.77)
Widowed/divorced/separated	1.65 (0.79, 3.47)	0.93 (0.47, 1.84)
Race/Ethnicity		
Non-Hispanic White	1.00 (-)	1.00 (-)
Non-Hispanic Black	1.05 (0.58, 1.91)	0.42 (0.29, 0.61)***
Hispanic	1.09 (0.57, 2.08)	0.38 (0.24, 0.61)***
Non-Hispanic Asian	0.39 (0.17, 0.91)*	0.16 (0.08, 0.32)***
Other	1.08 (0.45, 2.61)	1.13 (0.57, 2.21)
Citizenship status		
Not a US citizen	1.00 (-)	1.00 (-)
US citizen	0.67 (0.34, 1.3)	2.29 (1.14, 4.6)**
Primary Language (used in the interview)		
Spanish	1.00 (-)	1.00 (-)
English	0.94 (0.46, 1.89)	0.45 (0.25, 0.83)**
Level of education		
Less than high school	1.00 (-)	1.00 (-)
High school/GED or less	1.02 (0.54, 1.92)	0.65 (0.4, 1.06)
Some college/AA degree	2 (1.16, 3.46)**	1.04 (0.69, 1.56)
College graduate or above	1.64 (0.99, 2.72)	0.93 (0.58, 1.5)
Usual place for health care		
Doctors' office/HMO	1.00 (-)	1.00 (-)
Clinic/health center	1.38 (0.84,2.25)	1.15 (0.8,1.65)
Hospital ER/outpatient	5.4 (2.57,11.36)***	1.75 (0.78,3.95)
Other	4.11 (1.29,13.03)**	1.07 (0.38,3.04)
No place for healthcare	0.23 (0.08,0.64)**	0.42 (0.19,0.93)*

Type of insurance		
Private	1.00 (-)	1.00 (-)
Medicare/Medi-gap	1.76 (0.78,3.97)	1.45 (0.79,2.66)
Medicaid	3.04 (1.48,6.26)*	1.77 (1.09,2.9)
Other	2.25 (1.17,4.31)	1.25 (0.81,1.93)
Uninsured	1.33 (0.5,3.51)	1.1 (0.53,2.31)
Underlying chronic condition (Diabetes/Hypertension/Hypercholesterolemia)		
No	1.00 (-)	1.00 (-)
Yes	0.61 (0.35,1.07)	0.74 (0.43,1.28)
Prescription medicine for Diabetes		
No	1.00 (-)	1.00 (-)
Yes	0.98 (0.56,1.72)	1.15 (0.76,1.76)
Prescription medicine for Hypertension		
No	1.00 (-)	1.00 (-)
Yes	1.54 (0.9,2.65)	1.59 (1.07,2.35)*
Prescription medicine for Hypercholesterolemia		
No	1.00 (-)	1.00 (-)
Yes	1.41 (0.95,2.07)	1.75 (1.18,2.61)***

* p-value <0.05
** p-value <0.01
*** p-value <0.001

Figure 5: Two-way plot to demonstrate the adjusted odds ratio for mental health service utilization due to race/ethnicity and prescription medicine compliance among elderly with depression/anxiety using the NHANES, 2015-2018.



CHAPTER 5: UNDERSTANDING THE ECOLOGY OF MENTAL HEALTH AMONG ADOLESCENTS

ABSTRACT

Purpose: Mental health issues are a burgeoning public health concern among adolescents with increasing Adverse Childhood Experiences (ACE) and their impact on health outcomes continuing into adulthood. One in every five children between ages 13-18 in the US suffers from mental illness. There is evidence to describe associations between race, insurance, poverty, education, etc.; however, there is sparse literature to explain the collective impact of individual, family, and community characteristics on health outcomes among adolescents. The objective of this study is to understand and describe the impact of individual, family, and community-level factors on the presence of MH illness, health status, and mental toughness/flourishing behavior among adolescents.

Methods: Data from the National Survey of Children's Health, 2016-2018, was used to identify adolescents aged 10-17 years (n=59,504). The outcome variables measured the presence of mental illness, health status, and mental toughness. The independent variables were categorized into individual, family, and community characteristics. Bivariate analysis using the Pearson Chi-square test and multivariable logistic regression was conducted. The data were weighted in survey data analysis to produce nationally representative results.

Results: More than 30% of adolescents were overweight and 73% received preventive healthcare. Adolescents active for more than 60 minutes/week were more likely to have excellent health status. Adolescents with more than 4 hours of screen time/day were more likely to have mental problems and less likely to flourish. Adolescents who shared ideas with a parent were less likely to have a mental illness,

more likely to have excellent health status, and more likely to flourish. Adolescents with more than 2 ACEs were more likely to have mental problems (OR: 2.07, 95% CI: 1.79-2.38) and less likely to flourish (OR: 0.80, 95% CI: 0.69-0.93). Adolescents living in a safe and supportive neighborhood and attending a safe school were more likely to have excellent health status and more likely to flourish.

Conclusions: More research using longitudinal data is needed to understand the causality of foundational reasons behind mental health issues among adolescents. Public health interventions and strategies need to be implemented to address disparities in access to mental health care among adolescents along with training providers for appropriate care transition into adulthood.

INTRODUCTION

The social-ecological theory describes human development as dynamic interactions among multifaceted personal and environmental factors, such as home, neighborhood, school, and society (Bronfenbrenner, 1977). Physical and mental health outcomes can be understood within this conceptual framework not only with individual characteristics but determined by multiple inter-personal relationships such as those with parents, siblings, neighbors, peers, teachers, etc. (Swearer & Hymel, 2015). The framework helps to understand how diverse life experiences interact with biology and thereby impact the development of adverse physical and mental health outcomes among the adolescent population.

The WHO and the United Nations (UN) defines ‘adolescents’ as individuals in the 10-19 years age group or the transition period from childhood to adulthood which involves significant physical, sexual, psychological, and social developmental changes

(Department of Economics and Social Affairs, 2020). In addition to the development, this transition period makes them more prone to risks for their health and wellbeing. Some of the most common problems among adolescents are related to growth and development, childhood illnesses that continue into adolescence, mental health disorders, consequences of risky or illegal behaviors such as teenage pregnancy, substance abuse, infectious diseases, litigation, etc. (Ellis et al., 2003; Fergusson, Horwood, & Lynskey, 1997). However, these problems do not exist on an individual level only and rather occur as an additive effect of multiple factors at different levels. To better understand these factors, we use the hierarchical approach as explained by the social-ecological model with individual characteristics, family characteristics, and community characteristics.

The individual characteristics include age, gender, race/ethnicity, BMI, amount of physical activity, and screen time. Research has shown that obesity in adolescence, could result in chronic conditions in adulthood (Reilly & Kelly, 2011; Singh, A. S., Mulder, Twisk, Van Mechelen, & Chinapaw, 2008). Also, physical activity has been associated with a reduced risk of obesity, cardiovascular disease, diabetes, and several other comorbidities (Moore et al., 2016; Nocon et al., 2008). Physical activity during childhood and adolescence may have a positive impact on growth and development (CDC, 2021b), and psychological and emotional outcomes (Martinek, Cheffers, & Zaichkowsky, 1978), which may continue into adulthood (Ross & Hayes, 1988). However, past research shows that only 29% of high school students in the US reported meeting guidelines of at least 60 minutes of physical activity per day (Kann et al., 2014). A sedentary lifestyle is a key modifiable determinant of being overweight or obese. Literature also mentions that screen-based behaviors, such as television viewing and computer use are adversely associated with body composition (Gortmaker et al., 1996), cardiovascular disease risk

factors, mental health, sleep quality, and academic performance during adolescence (Nuutinen, Ray, & Roos, 2013; Tremblay et al., 2011).

There is a growing interest in adverse childhood experiences (ACE) and their impact on physical and mental health outcomes of an adolescent that continue into adulthood. One in five children have been sexually molested, one in four have been abused by a parent to the point of leaving a physical mark, one in four have alcoholic relatives, and one in eight have witnessed physical violence in their home (CDC, 2016). The traumatic experiences could be psychological, emotional, physical, etc., but their cumulative effects have greater implications (Felitti et al., 1998). The long-term negative consequences of childhood trauma and adversity have emerged as a major public health concern.

For more than a decade, the associations between childhood trauma and poor health outcomes have been documented in a series of well-known retrospective studies with adult populations and are referred to as the ACE studies. Several studies have successfully demonstrated potent links between ACE's and social, emotional, and cognitive damage (Anda et al., 2006; Briere, Kaltman, & Green, 2008; Felitti et al., 1998); adoption of health risk behaviors (Brown, D. W. et al., 2010; Felitti et al., 1998); disease, disability, and social problems (Anda et al., 2006; Brown, D. W. et al., 2010; Dube et al., 2002; Felitti et al., 1998), reduced life expectancy (Brown, D. W. et al., 2010), etc. The ACE studies have demonstrated that adverse experiences in childhood can have a profound impact on the course of health and development over a lifetime (Felitti et al., 1998; Kalmakis & Chandler, 2015). Despite plenty of literature that has assessed the impact of ACE on adolescent's health outcomes, there are gaps among analyses concerning the several factors that interplay with ACE at multiple levels combined.

The home and school environment determine the cognitive development of a child which has not been researched enough among adolescents (Edwards & Grossman, 1979). Being the most immediate environment, one of the most important factors to shape a child's behavior or influence mindset is the family. Infamously known as 'tiger parents', some parents are thought to be abnormally strict and expect their children to be perfect. Parents and siblings directly influence a child's behavior, eating habits, sleep patterns, or physical activity. In the US, the majority of children's diets consist of low-quality nutrition with 16% of the children and adolescents ages 2-19 not meeting any dietary recommendations (French, Story, & Jeffery, 2001; Munoz, Krebs-Smith, Ballard-Barbash, & Cleveland, 1997). The family has been suggested to play two significant roles in studies involving neighborhood factors such as being a mediator that transmits the effects of neighborhood conditions on a child's health, and as moderators that interact with neighborhood conditions to modify or buffer the effects of neighborhood conditions on child's health (Earls & Carlson, 2001).

Neighborhood conditions include the level of safety and support or trust (Diez Roux & Mair, 2010). Specific to adolescent health, two factors within the context of the social environment have been studied extensively in the past including social capital and social cohesion. Social capital is described as the resources that are elemental to individual relationships and has been examined to understand the relationship between neighborhood poverty and poor health outcomes (Cattell, 2001). Social cohesion is described as the extent to which people living together in one neighborhood share emotional support (Altschuler, Somkin, & Adler, 2004). Very few studies have examined the association between neighborhood conditions and child mental health and have shown a higher prevalence of mental health disorders in neighborhoods with poor social

cohesion and safety (Aneshensel & Sucoff, 1996; Gorman–Smith & Tolan, 1998; Xue, Leventhal, Brooks-Gunn, & Earls, 2005).

Mental health illness is a burgeoning concern for public health professionals and health care providers in the US with one in every five children between 13-18 suffering from a mental health condition (Mokri, 2019). Mental health has been recognized as a central determinant of individual well-being, family relationships, and engagement in society (Kessler, Walters, & Forthofer, 1998; Wulsin & Singal, 2003). Therefore, it is vital to treat the disorders when children are still young and in their early onset stages. Emotional, psychological, and social well-being as well as a person's ability to cope with everyday life all play a part in one's mental health. Mental illness produces adverse physical health consequences including a weak immune system, cardiovascular diseases, lethargy, hormonal imbalances, etc. (Mokri, 2019).

In 2017, The Substance Abuse and Mental Health Services Administration's (SAMHSA) (2015a) annual national report described a total of 46.6 million adults with mental illness, and about 11.2 million of those adults were found to have a serious mental illness. Although SAMHSA did not report on mental illness of the adolescent population, they did report depressive episodes among youth as the main cause of impairment in daily life. According to the report, 3.2 million youth aged 12-17 suffered from moderate depression. According to the NAMI (2020), 13-20% of adolescents aged 13 to 18 suffer from some form of mental health condition.

Researchers have also shown a general agreement that mental toughness is characterized by an individual's natural or developed capacity to be consistently successful in coping with the stress and anxiety during competitive and stressful situations (Gerber et al., 2012). Thus, mental toughness is related to the ability to remain determined, focused, confident, and in control under stress and pressure (Crust, 2008;

Mack & Ragan, 2008). There are some contradictory findings for describing the association between mental toughness and mental health outcomes. Some researchers have seen mental toughness in a positive light as it allows individuals to flourish in stressful situations with perceived positive pressure (Sheard, 2012), optimism, and self-efficacy (Clough, Earle, & Sewell, 2002; Nicholls, Polman, Levy, & Backhouse, 2008); yet some studies have linked mental toughness with a higher likelihood of mental illness (Crust & Keegan, 2010). Moreover, some researchers argue that mental toughness could buffer depressive symptoms because dysfunctional thoughts and maladaptive behavior are incompatible with the control, challenge, commitment, and confidence attributes, which characterize mental toughness (Gerber et al., 2012).

While informative and extensive, gaps exist in the literature to explain the collective effect of factors at multiple levels on the overall health outcomes of adolescents. It is imperative to study how these variables work alongside each other. Many previous pieces of literature have tried to explain associations between race, insurance coverage, poverty, education, etc. (Brooks-Gunn & Duncan, 1997; Gilman, Kawachi, Fitzmaurice, & Buka, 2002; Podorefsky, McDonald-Dowdell, & Beardslee, 2001; Shushansky, 2017; WHO, 2012; Yin et al., 2010). However, to the best of our knowledge, no recent study examines individual, family, and community characteristics collectively using a large multi-year nationally representative data study to describe factors independently and help policymakers design interventions for targeted populations to improve overall health outcomes.

The objective of this study is to understand and describe the impact of individual, family, and community-level factors among adolescents on (i) mental health (ii) general health status, and (iii) mental toughness/flourishing behavior. We hypothesize that (i) ACE's play a vital role in the overall health outcomes of adolescents (ii) safe and

supportive neighborhood and safe school environment plays a significant role in impacting health outcomes, and (iii) home environment impacts mental toughness/ flourishing behavior of adolescents.

METHODS

Data Source and Applicable Study Population

The National Survey of Children's Health (NSCH) 2016-2018 was used as the primary source for analysis which provides national and state-level data of non-institutionalized children in the US aged 0-17 years (US Census Bureau, 2020b). The NSCH data was funded and directed by the Health Resources and Services Administration's Maternal and Child Health Bureau (HRSA-MCHB). As stated in the Office of Management and Budget Clearance Package, the purpose of the NSCH was to "collect information on factors related to the well-being of children, including access to and quality of health care, family interactions, parental health, school and after-school experiences, and neighborhood characteristics." (US Census Bureau, 2018). Participants in the NSCH were randomly selected from US households from all 50 states and the District of Columbia. A screener instrument identified each household where one child was randomly selected to be the subject of the interview. The NCHS Research Ethics Review Board approved all data-collection procedures.

Cross-sectional data from three years were appended using the unique household identifier for each year. The study sample was limited to include adolescents of ages 10-17 years. Among the 69,435 adolescents from 2016-2018, 14.3% of the missing data were removed, and the final study population consisted of 59,504 adolescents.

Dependent variables

Three binary outcome variables were used to measure the overall health and well-being of an adolescent.

(i) Presence of mental/emotional/developmental/behavioral problem: We used eleven survey questions to construct binary categories of yes or no. The children could have a diagnosis of Tourette, anxiety, depression, behavior or conduct problem, developmental delay, intellectual disability or mental retardation, stuttering, stammering, or any other speech problems, learning disability, any other mental health condition, autism, Asperger's Disorder, pervasive developmental disorder, or other autism spectrum disorder, or ADD/ADHD. If a participant responded yes for any of the eleven mental health conditions, we coded it as yes.

(ii) Health of the adolescent: The initial survey responses were categorized into five categories of excellent, very good, good, fair, and poor. For the analysis in this study, we recategorized the responses into binary categories of good/fair/poor and very good/excellent.

(iii) Flourishing behavior/mental toughness: We used three survey questions to assess curiosity and discovery about learning, resilience, and self-regulation among adolescents. The questions asked if the ‘adolescent shows curiosity and interest in learning new things’, ‘adolescent works to finish tasks started’, and ‘adolescent stays calm and in control when faced with a challenge’. The ‘always’ response to all three questions indicated that the adolescent met the criteria for flourishing behavior or mental toughness. The response to any two items was marked as ‘usually’ and one item was marked as ‘somewhat’. For the analysis in the study, the responses were divided into binary categories of ‘usually/sometimes/never’ and ‘always’.

Independent variables

The primary independent variable measured ‘if the adolescent had an ACE. We used nine ACE related variables: (i) hard to get by on family’s income, (ii) parent or guardian divorced or separated, (iii) parent or guardian died, (iv) parent or guardian served time in jail, (v) adolescent saw or heard parents/adults slap/hit/punch/kick one another in the home, (vi) adolescent was a victim of violence or witnessed violence in the neighborhood, (vii) adolescent lived with anyone with mental illness, severe depression, or suicidal ideation, (viii) adolescent lived with anyone with alcohol or drug abuse, and (ix) adolescent was treated/judged unfairly due to race/ethnicity. The 9 variables were recoded into a variable with three categories: no ACE, one ACE, and two or more ACE.

To better understand and describe the ecology of mental health, other explanatory variables were divided into three categories: individual, family, and community characteristics.

The individual explanatory variables included (i) Body mass index: the calculation was based on parental survey responses regarding height and weight of the adolescent using CDC age-sex growth chart (CDC, 2015). The categories for describing BMI by NSCH were underweight (below 5^{th} percentile), normal (5^{th}-84^{th} percentile), overweight (85^{th}-94^{th} percentile), and obese (above 94^{th} percentile). We used the same categories for analysis, (ii) The number of days an adolescent exercise, plays a sport, or participates in physical activity for at least 60 minutes in one week (0 days, 1-3 days, 4-6 days, and every day), and (iii) Amount of time spent in front of a television, computer, cellphone, or other electronic devices watching programs, playing games, accessing the internet, or using social media, excluding schoolwork, on most weekdays (0-1 hour, 2-3 hours, and 4 or more hours).

The family explanatory variables included (i) Highest level of education of adults in the household who are identified as the adolescents' primary caregiver (less than high school, high school/GED, some college/AA degree, and a college graduate or higher), (ii) Overall physical and mental health of the parent: four survey questions were combined that asked ‘if the child’s mother lives in the household, in general, what is the mothers physical health status?’, ‘if the child’s father lives in the household, in general, what is the fathers' physical health status?’, ‘if the child’s mother lives in the household, in general, what is the status of mothers mental and emotional health?’, and, ‘if the child’s father lives in the household, in general, what is the status of fathers mental and emotional health?’. The responses were categorized as fair/poor, excellent, and no parent reported in the household.

(iii) Presence of an adult smoker in the household (no/yes): the survey question asked, ‘does anyone living in this child’s household use cigarettes, cigars, or pipe tobacco?’, (iv) Adolescent shares ideas or talks about things that matter with a parent (somewhat/not very well and very well), and (v) Afford nutritious meals: the survey question describes the food insufficiency situation in the child’s household in the last 12 months and was categorized as could always afford to eat good nutritious meals, could always afford enough to eat but non-nutritious, and sometimes/often could not afford enough to eat.

(vi) Adolescents received preventive medical- and dental-care visits (no/yes): this variable was derived from multiple survey questions by combining the parents’ response to their child’s receipt of preventive medical care and preventive dental care in the past 12 months. Participants from the year 2018 responded differently to the questions on preventive medical care as the filter item which preceded it about the use of any medical care in the past 12 months was changed in comparison to prior years. However, after

combining with the preventive dental care measure, the overall measure of preventive care (both medical and dental) did not see significant differences between the three years studied in this analysis and therefore were considered comparable, (vii) Adolescent has a usual source to obtain health care: this variable was derived from the survey question ‘whether the child has a usual place to go when they are sick?’ The criteria for having a usual source of sick care were categorized as doctor’s office, hospital outpatient, clinic or health center, retail store clinic or minute clinic, school (nurses office, athletic trainer’s office), or some other place. The emergency room was not defined as a usual source of care. For analysis, the responses were categorized as yes, and no.

(viii) Adolescent always received care when needed (no/yes), and (ix) Type of health insurance: this variable was derived using two survey questions for ‘whether the child was currently insured’ and ‘type of child’s insurance’ and was categorized as private, public, multiple, and uninsured. Private insurance was defined as insurance through a current or former employer or union, insurance purchased directly from an insurance company, TRICARE, other military health care, coverage through the Affordable Care Act, or other private insurance. Public insurance was defined as Medicaid, medical assistance, or any kind of government assistance plan for those with low income or disability. The adolescents covered with both public and private types of insurance were categorized as having multiple insurances. Children covered under only Indian Health Services, or a religious health share were considered uninsured.

The community explanatory variables included (i) Adolescent lives in a safe and supportive neighborhood: The survey questions to measure neighborhood support, cohesion, and social capital asked, ‘people in my neighborhood help each other out’, ‘watch out for each other’s children in this neighborhood’, and ‘when we encounter

difficulties, we know where to go for help in our community'. Responses were marked using a 4-point Likert scale from 1 (strongly agree) to 4 (strongly disagree). A response of definitely agree to all three questions was the criteria for a neighborhood to be supportive. Neighborhood safety was derived from the survey question 'How often do parents feel that their child is safe in the neighborhood?'. The responses for a supportive and safe neighborhood were combined and categorized as yes and no, (ii) Adolescent is safe at school: responses were categorized as yes and no, and (iii) adolescent participates in extra-curricular activities: the activities were defined as those outside school including but not limited to sports team or lessons, clubs, or organizations that take place after school or on weekends, or any other organized activities or lessons such as music, dance, language, arts, etc. The responses were categorized as yes and no.

In addition to the primary independent variables, demographic and socio-economic variables such as age, gender, and race/ethnicity were adjusted for in the multivariable regression analysis. For analysis, two age groups were defined among adolescents (10-13 years and 14-17 years) and five categories were defined for race/ethnicity (non-Hispanic White, Hispanic, Black, Asian, and AI/AN/NH/PI).

Analysis

We present descriptive summary statistics for each variable among the total study population and stratified by the presence of an ACE. Bivariate analysis was performed using the Pearson Chi-square test, to examine the differences among each variable between adolescents with and without ACE. Multivariable logistic regression was used to investigate the association of ACE with the physical and mental health status after adjusting for all individual, family, and community explanatory variables.

All estimates were adjusted with probability weights, primary sampling unit, and strata in survey data analysis to produce nationally representative individual-level estimates. Average weights were constructed for three years to report multi-year population estimates (US Census Bureau, 2020c). For bivariate analysis, the p-values were calculated with a significance level of 0.05.

UNMC IRB review was waived as the participant information was de-identified in the public use file. The data were analyzed, and two-way plots were created using STATA MP v 16.1 (Stata Statistical Software: Release 16.1. College Station, TX: StataCorp LLC). The data were mapped using ArcGIS software, Version 10.4 (Esri, Redlands, CA).

RESULTS

A total study population of 59,504 adolescents in the age group of 10-17 years was included in the data analysis.

The descriptive summary statistics of the demographic and socio-economic factors were presented among the total study population and stratified by the presence or absence of ACEs in Table 10. A similar distribution was observed in all age groups for the presence of ACE's. 47.8% of adolescents had more than four days of physical activity for at least 60 minutes in one week ($p<0.001$), more than 30% of adolescents were either overweight or obese ($p<0.001$), and 26% of adolescents had a screen time of four hours or more in front of a television, computer, cellphone, or other electronic devices per day ($p<0.001$).

The descriptive summary statistics of the family and community characteristics were presented among the total study population and stratified by the presence or

absence of ACEs in Table 11. 77.3% of adolescents had a usual source to obtain health care ($p<0.001$), 96% of adolescents received needed health care ($p<0.001$), and 73.5% of adolescents received preventive health care ($p<0.001$). 65% of adolescents were able to share their ideas very well or talk about things that matter with a parent ($p<0.001$). 61.2% of adolescents were covered under private insurance ($p<0.001$), 48.1% of the adolescents had a parent with an education level of college or above ($p<0.001$), and 93.5% of adolescents had parents with excellent overall health status ($p<0.001$). Among the adolescents with more than 2 ACEs, 26.7% lived in a household with an adult smoker, 58% could not afford nutritious meals, and 42.5% could not share ideas or talk about things that matter with a parent. 95.4% and 97% of adolescents lived in a safe and supportive neighborhood and were safe at school respectively ($p<0.001$). 82.4% of adolescents participated in extra-curricular activities ($p<0.001$) and 25.5% of adolescents had more than two ACEs.

The descriptive statistics for the outcome variables were presented among the total study population and stratified by the presence or absence of ACEs in Table 12. 68.5% of adolescents did not have a mental/emotional/behavioral/developmental problem, 88.6% of adolescents had very good/excellent health status, and 30% of adolescents always flourished ($p<0.001$). 31% of the adolescents with one ACE and 47% of the adolescents who had more than two ACEs had a mental/emotional/behavioral/ developmental problem. 71.6% of the adolescents with one ACE and 78.3% of the adolescents who had more than two ACEs did not always flourish.

The association of the individual characteristics with the presence of mental/emotional/behavioral/developmental problems, the health status of the adolescent, and if the adolescent is flourishing in multivariable logistic regression

analysis is presented in Table 13. In comparison to adolescents in the age group of 10-13 years, the adolescents of ages 14-17 were more likely to flourish (odds ratio [OR]: 1.53, 95% confidence interval [CI]: 1.38-1.70). Females were less likely to have mental/emotional/ behavioral/developmental problems (OR: 0.69, 95% CI: 0.62-0.76) and more likely to flourish (OR: 1.19, 95% CI: 1.08-1.32) than males. In comparison to Non-Hispanic White adolescents, Hispanic adolescents were less likely to have a very good/excellent health status (OR: 0.76, 95% CI: 0.59-0.96). However, Hispanic (OR: 1.35, 95% CI: 1.16-1.58) and Asian (OR: 1.76, 95% CI: 1.37-2.25) adolescents were more likely to flourish than Non-Hispanic White adolescents.

In comparison to adolescents who had 0 days of being physically active for more than 60 minutes in a week, the adolescents who were active for 1-3 days (OR: 0.69, 95% CI: 0.58-0.82), 4-6 days (OR: 0.55, 95% CI: 0.45-0.67), or every day (OR: 0.58, 95% CI: 0.48-0.72) were less likely to have mental/emotional problems. Also, the adolescents who had 1-3 days (OR: 1.56, 95% CI: 1.25-1.94), 4-6 days (OR: 2.64, 95% CI: 2.02-3.46), or every day (OR: 2.48, 95% CI: 1.78-3.45) of physical activity for more than 60 minutes were more likely to have very good/excellent health status. The adolescents who were physically active for more than 60 minutes for 1-3 days (OR: 1.33, 95% CI: 1.08-1.64), 4-6 days (OR: 1.77, 95% CI: 1.43-2.19), or every day (OR: 2.01, 95% CI: 1.60-2.53) of being were more likely to flourish as compared to adolescents with 0 days of physical activity.

In comparison to adolescents who had a normal BMI (5^{th}- 84^{th} percentile), the adolescents who were underweight (less than 5^{th} percentile) (OR: 0.57, 95% CI: 0.42-0.79), overweight (85^{th}-94^{th} percentile) (OR: 0.70, 95% CI: 0.53-0.91), or obese (more than 95^{th} percentile) (OR: 0.39, 95% CI: 0.31-0.48) were less likely to have very good/ excellent health status. In comparison to adolescents who spent less than one hour per

day in front of a television, computer, cellphone, or other electronic devices per day, the adolescents who spent 2-3 hours (OR: 1.16, 95% CI: 1.03-1.31) or 4 hours or more (OR: 1.33, 95% CI: 1.15-1.55) were more likely to have mental/emotional problem. Also, the adolescents who spent 2-3 hours (OR: 0.60, 95% CI: 0.53-0.68) or 4 hours or more (OR: 0.47, 95% CI: 0.40-0.56) were less likely to flourish. Figure 5 displays a two-way plot to demonstrate the association of the individual characteristics with mental health status among adolescents.

The association of the family and community characteristics with the presence of mental/emotional/behavioral/developmental problems, the health status of the adolescent, and if the adolescent is flourishing in multivariable logistic regression analysis is presented in Table 13. Adolescents who had a parent with an education level of college or above were more likely to have a very good/excellent health status (OR: 1.41, 95% CI: 1.08-1.85) than those with an education level of less than high school. In comparison to adolescents who have a parent with fair/poor physical and mental health, the adolescents who have a parent with excellent overall health were less likely to have mental/emotional/behavioral/developmental problems (OR: 0.51, 95% CI: 0.35-0.75) and more likely to have excellent health status (OR: 1.99, 95% CI: 1.29-3.05).

The adolescents who had an adult smoker in the household were more likely to have a mental/emotional/behavioral/developmental problem (OR: 1.39, 95% CI: 1.18-1.64) and less likely to flourish (OR: 0.69, 95% CI: 0.59-0.81). The adolescents who always received needed health care were less likely to have mental/emotional problems (OR: 0.51, 95% CI: 0.38-0.70), more likely to have very good/excellent health status (OR: 1.89, 95% CI: 1.37-2.62) and more likely to flourish (OR: 3.36, 95% CI: 2.40-4.71). The adolescents who were able to share ideas very well or talk about the things that matter with a parent were less likely to have mental/emotional problems (OR: 0.52, 95%

CI: 0.47-0.58), more likely to have very good/excellent health status (OR: 1.82, 95% CI: 1.52-2.17), and more likely to flourish (OR: 3.28, 95% CI: 2.93-3.66).

In comparison to adolescents who lived in a household that could always afford a nutritious meal, the adolescents who lived in a household who often could not afford nutritious meals were more likely to have mental/emotional problems (OR: 1.36, 95% CI: 1.03-1.80) and less likely to have very good/excellent health status (OR: 0.53, 95% CI: 0.35-0.81). The adolescents who lived in a household that could afford only non-nutritious meals were less likely to have very good/excellent health status (OR: 0.68, 95% CI: 0.55-0.84) and less likely to flourish (OR: 0.72, 95% CI: 0.62-0.83).

The adolescents covered under public insurance only were less likely to have excellent health status (OR: 0.53, 95% CI: 0.43-0.66) and less likely to flourish (OR: 0.79, 95% CI: 0.66-0.93) as compared to those with private insurance. In comparison to adolescents who did not participate in extracurricular activities, the adolescents who participated were less likely to have mental/emotional problems (OR: 0.64, 95% CI: 0.55-0.76), more likely to have very good/excellent health status (OR: 1.29, 95% CI: 1.04-1.60), and more likely to flourish (OR: 1.42, 95% CI: 1.18-1.71).

In comparison to adolescents who had no ACE, the adolescents who had one ACE (OR: 1.28, 95% CI: 1.12-1.46) or more than 2 ACE (OR: 2.07, 95% CI: 1.79-2.38) were more likely to have mental/emotional/behavioral/developmental problem. In comparison to adolescents who had no ACE, the adolescents who had more than two ACE were less likely to flourish (OR: 0.80, 95% CI: 0.69-0.93). Figure 7 shows a GIS map to identify states with adolescents with at least one ACEs and the presence of mental health problems. The adolescents who lived in a safe and supportive neighborhood were more likely to have very good/excellent health status (OR: 1.64, 95% CI: 1.02-2.64). The adolescents whose parents reported safety at school were less likely

to have mental/emotional problems (OR: 0.46, 95% CI: 0.34-0.62), more likely to have excellent health status (OR: 2.09, 95% CI: 1.40-3.11), and more likely to flourish (OR: 1.98, 95% CI: 1.39-2.81).

DISCUSSION

This study provides a fresh set of estimates to better understand the ecology of health outcomes among adolescents based on the individual-, family-, and community-characteristics. Some of the key findings include (i) adolescents with more than 2 ACEs' are more likely to have mental health conditions and less likely to flourish (ii) Hispanic and Asian adolescents are less likely to have mental health problems and more likely to flourish (iii) Physical activity for at least 60 minutes for more than three days a week is highly associated with better health outcomes (iv) Sharing ideas or talking about things that matter with a parent and eating nutritious meals are highly associated with better health outcomes, and (v) living in a safe and supportive neighborhood and safe school environment is associated with better health outcomes and flourishing behavior.

Individual characteristics

(i) Race/ethnicity: Stigma around mental illness is a major problem among minority communities (Nadeem et al., 2007). For children and adolescents, who are often dependent on their caregivers for both formal and informal health care, a parent or caregiver who disapproves of mental health concerns could act as a barrier to formal mental health care despite the absence of other structural barriers (McKay, Stoewe, McCadam, & Gonzales, 1998). Other parent-level barriers include lack of recognition of psychiatric symptoms, different preferences, and expectations of care (Cristancho,

Garces, Peters, & Mueller, 2008). Moreover, there is insufficient research on how cultural factors, self-perceived social status, and racial discrimination impact mental health. Our findings show less prevalence of mental/emotional problems among Hispanics, Blacks, and Asian adolescents which is contradictory to previous studies (Center for American Progress, 2020). As our results are based on parental reports of adolescent's health conditions, we attribute these inconsistent findings to the stigma associated with mental health among children (Chen, S. X. & Mak, 2008; Magaña et al., 2013; Rowland et al., 2002). Moreover, our findings showed a higher likelihood of Hispanic and Asian children to have flourishing behavior which could also be attributed to the parental perception and cultural differences to acknowledge healthcare problems.

(ii) BMI: BMI is used as an approximate indicator of health calculated using body weight and height. It categorizes a person as underweight, normal weight, overweight, or obese (CDC, 2020b). Several findings exist in the literature that describes the relationship between adolescent health and BMI status. In comparison to normal-weight adolescents, those who are overweight/obese are more likely to experience impaired peer relationships, stigma, and weight bias (Ebbeling, Pawlak, & Ludwig, 2002; Ludwig, 2007; Puhl, Moss-Racusin, Schwartz, & Brownell, 2008). Due to a lower tolerance for body size fluctuation, adolescents who are overweight/obese are more likely to suffer from weight-related stigma and stress (Rand & Wright, 2000). Though obesity is not a psychological disorder, some researchers and clinicians argue to classify obesity as a mental or behavioral issue (Cornette, 2011). Nevertheless, obesity is still considered a medical condition, and research has focused neither on understanding the psychological burden of living with obesity nor the impact of obesity on mental health.

Weight bias is a real social concern and the stigma around it creates a vicious cycle of poor physical and mental health which further compromises the motivation to

adopt lifestyle and behavior changes to prevent or treat obesity. Moreover, recommendations to include weight bias awareness and obesity prevention efforts have been largely ignored (Puhl & Heuer, 2010). In recent times, several researchers have suggested that a public health response to childhood obesity should include intervention across multiple sectors (Fenton, Brooks, Spencer, & Morgan, 2010; Public Health Agency of Canada, 2010). Parents and teachers serve as role models for influencing children's attitudes and behaviors towards their bodies. Similarly, the attitudes towards abnormal weight, and particularly obesity, could produce harmful effects on a young mind (Haines & Neumark-Sztainer, 2006). Consistent with the literature, our findings show that adolescents with abnormal BMI are more likely to have poor health outcomes.

(iii) Physical activity: The effect of physical activity on mental health in children and adolescents has received significantly less attention than in adult populations (Whitelaw, Teuton, Swift, & Scobie, 2010). The first systematic review describing the relationship between physical activity and mental health in adolescents was published as part of the American physical activity guidelines process (Calfas & Taylor, 1994). However, the authors had used a wider age range of 11-21 years. Very few researchers have examined the interplay of environmental and psychosocial factors with adolescent physical activity (De Meester, Van Dyck, De Bourdeaudhuij, Deforche, & Cardon, 2013; Deforche, Van Dyck, Verloigne, & De Bourdeaudhuij, 2010).

Adolescents are often put under academic pressure to meet high scholarly standards and achievements which creates a routine with more emphasis on study time and less physical activity (Hardman, 2008). Moreover, technology has provided children with opportunities to play video games, watch television, or browse social media, which has significantly contributed to sedentary behaviors (Stevens, To, Stevenson, & Lochbaum, 2008). Also, parents have reported concern about their children's safety

while playing outdoors or using active means of transportation such as biking or walking on their way to school which has further limited the amount of physical activity (WHO, 2020b). Thereby, there is no compensation for the loss of physical activity leading to a sedentary lifestyle throughout the majority of the week (Dale, Corbin, & Dale, 2000).

Some studies have mirrored the results as done among adult populations, where physical activity has shown significant benefits in lowering depression, anxiety, and overall psychological distress (Dixon, W. A., Mauzey, & Hall, 2003). Our findings show that physically active adolescents were less likely to have mental/emotional/behavioral/ developmental problems and more likely to have better health status. Also, physically active adolescents showed more mental toughness/flourishing behavior. In the literature, mental toughness has been predominantly investigated from a performance-oriented perspective. From a mental health perspective, mental toughness could also be seen as a source of resilience (Gerber et al., 2012).

(iv) Screen time: The American Academy of Pediatrics (AAP) (2001) recommends that adolescents limit television and other screen time to no more than two hours per day (Barlow & Expert Committee, 2007). However, the typical adolescent is estimated to watch 2.5 to 3 hours of television per day and spend an additional 1.5 to 2 hours using the computer (Nelson, Neumark-Stzainer, Hannan, Sirard, & Story, 2006). Some studies have shown that in the US, school-aged children and adolescents spend around 7 hours per day in front of a screen (Rideout, Foehr, & Roberts, 2010; Strasburger, Jordan, & Donnerstein, 2010).

Television viewing remains the predominant source of children's electronic media use in the U.S (Rideout et al., 2010). In the past year during the COVID-19 pandemic, the schools turned to online learning systems and adolescents inevitably had to be in front of computer screens for a longer period. Nevertheless, some studies have shown a

positive association of screen time and online communication with improved self-esteem, relationship building, and quality of friendships (Boniel-Nissim et al., 2015; Valkenburg & Peter, 2011). The easy availability of screens, access to the Internet, and the influence of the culture of social media in adolescents' lives have normalized this behavior among parents (Ramirez et al., 2011). Nearly 97% of US adolescents have at least one electronic item such as television, computer, mobile phone, video game console, etc. in their bedroom (National Sleep Foundation, 2006). Also, with the universal presence of media items in a bedroom, screen time is hypothesized to be a cause of insufficient and low-quality sleep (Cain & Gradisar, 2010).

Studies have shown higher leisure screen time is associated with poor health outcomes (Page, Cooper, Griew, & Jago, 2010). Our findings showed poor mental health with a screen time of more than 2 hours per day which is consistent with the AAP guidelines. Also, adolescents with a higher screen time were less likely to have flourishing behavior. However, adolescent perception of home rules will help guide these associations better rather than relying on parent perception alone. Perceptions and differences in beliefs between adolescents and parents on home rules related risk behaviors could be targeted by health promotion interventions as well (Ramirez et al., 2011).

Family characteristics

(i) ACE: ACEs encompass harmful acts of emotional, physical, or sexual abuse, familial and socio-environmental influences such as parental drug use, poverty, neighborhood, or domestic violence, etc. Evidence suggests that nearly half of all children in the US are exposed to at least one social or family-related ACE, and nearly a

quarter experience at least two ACE's (Bethell et al., 2014). ACEs have been consistently linked to an array of health problems that continue into adulthood, such as depression and suicide (Chapman et al., 2004), alcohol and drug abuse (Dube et al., 2002), premature mortality (Kelly-Irving et al., 2013), and chronic health conditions (Chartier et al., 2010).

Literature suggests that by the time children have been exposed to four or more ACEs, the odds of having negative health outcomes in adulthood are up to 12 times as compared to children without ACE (Felitti et al., 1998). Researchers have examined the relationship between individual ACEs such as parental violence, family disruption, poverty or neighborhood violence, and negative health outcomes among adolescents (Brooks-Gunn, 1997; Conger, Conger, & Martin, 2010; Fan & Chen, 2012). Research about ACEs has described the associations with health risks (Lanier, Maguire-Jack, Lombardi, Frey, & Rose, 2018), school-success related factors (Balistreri, 2015), and health care support (Lanier, Maguire-Jack, & Welch, 2015). Children with an alcoholic parent who abuse their spouses are twice as likely to experience other ACEs (Dube et al., 2002). However, the literature barely describes the cumulative effect of other environmental and social factors along with ACE on health outcomes among adolescents.

Primary prevention of ACEs has proven difficult in the past (Hardy & Streett, 1989; Olds, Henderson, Chamberlin, & Tatelbaum, 1986) and will eventually require societal changes that aid in the improvement of the quality of household environments. Another vital component of the social environment of adolescents is their school which needs to be trauma-informed (Perfect, Turley, Carlson, Yohanna, & Saint Gilles, 2016). Research has shown that among the school-going population, adolescents reported having one or more traumatic events by age 17 which can negatively impact their

cognitive, academic, social, emotional, and behavioral development (Felitti & Anda, 1997; McLaughlin et al., 2013). In this study, we describe the concurrent impact of several psycho-social and environmental factors along with the presence of ACE on the physical and mental health outcomes of adolescents. Our study findings showed that adolescents with 1 or more ACE were more likely to have poor mental health and those with more than 2 ACE were less likely to be mentally tough or flourish.

(ii) Access to health care (source, preventive, foregone, insurance): Among adolescents, access to health care is dependent on parents or caregivers. Several reasons for adolescent morbidity such as substance use, sexually transmitted infections, and mortality such as violence, suicide, etc. are preventable which lays focus on preventive health care interventions and easy access to health care when needed. Guidelines issued by the AAP in 2017 recommended preventive care services up to age 21 years, including the delivery of adolescent preventive services in an annual visit (Hagan, Shaw, & Duncan, 2007). Some studies described parental perceptions related to lower adolescent well visits due to unaffordability and a common belief of routine visits being unnecessary unless sick (Aalsma, Gilbert, Xiao, & Rickert, 2016).

Our findings show that the adolescents who received health care services when needed were more likely to have better health status and very likely to be mentally tough/flourish. Also, as adolescents are dependent on parents for their insurance and access to health care, there are parent level barriers to receive adequate care. We found a unique association in our findings where the adolescents with public insurance were less likely to have good health status and less likely to flourish in comparison to private insurance. This finding could be attributed to lower household income, adolescents living in a single-parent household, parents with a part-time job or unemployed, level of education of high school or less, etc. (DeVoe, Tillotson, & Wallace, 2008).

(iii) Family time (affording nutritious meals, sharing ideas, and an adult smoker in the household): Positive family functioning can be measured as positive and frequent parent-child interaction which acts as a protective factor during adversity. Studies have suggested that adolescents with positive family functioning have better physical and emotional health (Balistreri & Alvira-Hammond, 2016). Shared meals with the family offer a regular and ample learning environment where all members of the family sit together and engage in conversations. We found that adolescents who can share ideas or talk to a parent very well about things that matter are less likely to have mental health problems and more likely to have good health status. Moreover, these adolescents were likely to have flourishing behavior.

Parental eating habits may positively influence an adolescent's dietary behavior inside and outside the family home (Brown, K. A., Ogden, Vögele, & Gibson, 2008). A healthy diet is often considered as the number of portions of fruit and vegetables consumed per day (Caspi, Sorensen, Subramanian, & Kawachi, 2012). Evidence suggests that eating five or more portions per day reduces the risk of cancer and cardiovascular disease (Aune et al., 2017). An unhealthy diet is generally described as the consumption of sugar-sweetened beverages, fast food, unhealthy sweet or salty snacks, etc. (Caspi et al., 2012; Vartanian, Schwartz, & Brownell, 2007). A higher intake of sugar and fat is also associated with a higher risk of diabetes, high blood pressure, heart disease, and obesity (McGuire, S., 2012).

School-going adolescents eat almost half of their meals during school hours (Briefel, Wilson, & Gleason, 2009) and are provided with easy options of using vending machines with unhealthy snacks (O'toole, Anderson, Miller, & Guthrie, 2007). Food insecurity currently affects about 15 million US households (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2018) and is considered a serious public health issue because of its

strong association with a wide range of health, nutrition, and developmental outcomes (Gundersen & Ziliak, 2018).

Our study findings showed that adolescents who lived in a household that could afford only non-nutritious meals or not afford meals at all were more likely to have poor health outcomes. Also, the adolescents who ate non-nutritious meals were less likely to flourish. Adolescents imbibe habits from parents that can have a direct or indirect impact on their health outcomes. Parental smoking has been associated with adolescent smoking uptake suggesting intergenerational transmission of smoking behavior within families (Avenevoli & Merikangas, 2003). Parental smoking cessation counseling interventions have been tried in pediatric settings with a modest impact (Priest et al., 2008), and despite such interventions, most parents do not quit smoking (Rosen, Noach, Winickoff, & Hovell, 2012). Our study findings showed that adolescents who live in households with an adult smoker were more likely to have mental health problems and less likely to flourish.

Community characteristics

(i) Extracurricular activities: Research shows an association of extra-curricular activity participation with positive development (Farb & Matjasko, 2012). Consistent with the previous findings we found extracurricular activity participation to be positively linked with better health outcomes and flourishing behavior among adolescents.

(ii) Safe and supportive neighborhood: Researchers refer to the physical environment of a neighborhood which includes the built structures, air and water, indoor and outdoor noise, neighborhood amenities such as parks, sidewalks, library, etc., as one of the key drivers for health disparities, including mental health, and obesity

(Ellaway & Macintyre, 2004; Galea & Vlahov, 2005). Research dating back more than a century found that residents living in neighborhoods characterized by greater physical disorders like trash, graffiti, unkempt vegetation, and deteriorating buildings are more likely to be exposed to crime and suffer more health problems (Hirschfield & Bowers, 1997). However, limited studies have identified the impact of neighborhood social conditions which include the level of safety, support/trust, and associated with mental health disorders (Aneshensel & Sucoff, 1996; Diez Roux & Mair, 2010; Gorman–Smith & Tolan, 1998).

We aimed to fill this gap in the literature by using nationally representative data to elucidate neighborhood social circumstances that may be important targets for interventions to decrease the mental health burden. Moreover, previous studies have measured neighborhood safety using adolescent reports of perceived safety (Lenzi et al., 2012). In this study, we considered parental reports for neighborhood social conditions.

Past literature shows perceptions of higher neighborhood safety were associated with less time spent in sedentary behavior (Burdette & Whitaker, 2005). Also, parental perceptions of the neighborhood were less likely to be related to adolescent behavior than to the behavior of younger children as adolescents have more autonomy. Singh et al (2008), used data from the 2003 NSCH and found that adolescents living in neighborhoods with the lowest social support or lower levels of social cohesion and trust had a higher odd of being obese. Some other studies have found neighborhood safety to be associated with a higher prevalence of being overweight or obese (Bacha et al., 2010). Negative parental perceptions of the neighborhood environment could act as a barrier to adolescents' physical activity outside of the home. Parents who perceive their neighborhood as disordered may restrict the time that their children spend outside,

leading to higher levels of sedentary lifestyle (Cecil-Karb & Grogan-Kaylor, 2009). Our findings showed that adolescents living in safe and supportive neighborhoods were more likely to have better health status.

(iii) Safe school: A safe school is defined as one where the overall school climate allows students, teachers, administrators, staff, and visitors to interact in a positive, non-threatening manner which reflects the educational mission of the institution along with promoting positive relationships and growth (Bucher & Manning, 2005). A safe school grants freedom from violence, fear, and intimidation and provides a caring environment where expectations for student behavior are clearly expressed (Mabie, 2003). School safety implies not only physical safety but also intellectual and emotional safety (Merrow, 2004). As adolescents spend significant time at both school and home, it is important to consider the cumulative or interactive effects of school and neighborhood environments on health behaviors and outcomes.

Although several studies have described interactions between school and neighborhood characteristics on a variety of outcomes, the literature is sparse to describe the simultaneous associations of school and neighborhood contexts on overall health-related outcomes among adolescents. School connectedness, similar to neighborhood social cohesion, is a vital component of the school climate and refers to the sense of attachment and loyalty among students for their school (CDC, 2009; Sampson, Morenoff, & Earls, 1999). Our findings showed that adolescents who attend a school that is perceived as safe by their parent or primary caregiver were less likely to have mental/emotional health problems. Also, these adolescents were more likely to have good health status and flourishing behavior.

Limitations

One of the most important strengths of this study was the use of a recent multi-year nationally representative dataset with a large study population which allowed us to control for potential confounders and examine the independent effects of several factors on mental health and its service utilization. However, the study has some limitations which need to be considered. Due to the cross-sectional nature of the NSCH, it is not possible to establish a causal relationship between the exposure and outcome factors. Besides, the use of the parental report of their child's weight and height may result in the underestimation of BMI (Akinbami & Ogden, 2009). However, the parental report has been considered an accurate indicator of obesity among adolescents (Goodman, Hinden, & Khandelwal, 2000).

CONCLUSION

The results of this study describe the ecology of mental health and its determinants for the adolescent population. More rigorous research is needed in the future to demonstrate the association between ACEs, neighborhood, and social environment with health outcomes using longitudinal data to understand the causality. Public health interventions and strategies need to be implemented to address disparities in access to mental healthcare among adolescents.

Table 10: Descriptive characteristics for the demographic and socio-economic status and individual characteristics stratified by presence of ACE using the NSCH, 2016-2018

	Total sample	Adverse Childhood Experiences			
	(n=59,504) n (%)	No ACE (n=29,311) n (%)	One ACE (n=15,011) n (%)	More than two ACEs (n=15,181) n (%)	P-value
Age category					<0.001
10-13 years	29777 (50.04)	15604 (53.23)	7425 (49.46)	6748 (44.45)	
14-17 years	29727 (49.96)	13707 (46.77)	7586 (50.54)	8433 (55.55)	
Sex					0.9411
Male	30627 (51.47)	15090 (51.48)	7767 (51.74)	7769 (51.17)	
Female	28877 (48.53)	14221 (48.52)	7244 (48.26)	7412 (48.83)	
Race/Ethnicity					<0.001
Non-Hispanic White	31525 (52.98)	16685 (56.92)	7501 (49.97)	7338 (48.34)	
Hispanic	14611 (24.56)	7098 (24.22)	3860 (25.72)	3653 (24.06)	
Black	7657 (12.87)	2533 (8.64)	2409 (16.05)	2714 (17.88)	
Asian	2550 (4.28)	1715 (5.85)	549 (3.66)	286 (1.88)	
American Indian/Alaskan Native/Native Hawaiian/Pacific Islander	3162 (5.31)	1280 (4.37)	691 (4.60)	1191 (7.85)	
Amount of physical activity (at least 60 minutes/week)					<0.001
0 days	6559 (11.02)	2338 (7.98)	1788 (11.91)	2432 (16.02)	
1-3 days	24480 (41.14)	11701 (39.92)	6688 (44.56)	6091 (40.12)	
4-6 days	17310 (29.09)	9753 (33.27)	3922 (26.13)	3635 (23.94)	
Everyday	11154 (18.75)	5519 (18.83)	2612 (17.40)	3023 (19.91)	
Body mass index					<0.001
Normal (5th-84th percentile)	37365 (62.79)	19724 (67.29)	9083 (60.51)	8556 (56.36)	
Underweight (<5th percentile)	4039 (6.79)	2262 (7.72)	983 (6.55)	794 (5.23)	
Overweight (85th-94th percentile)	9146 (15.37)	4165 (14.21)	2338 (15.58)	2643 (17.41)	
Obese (>95th percentile)	8955 (15.05)	3160 (10.78)	2607 (17.37)	3188 (21.00)	

Screen time per day (TV/mobile/computer/video games)					<0.001
0-1 hours	12148 (20.42)	7357 (25.10)	2581 (17.19)	2211 (14.56)	
2-3 hours	31867 (53.55)	15830 (54.01)	8551 (56.96)	7485 (49.31)	
4 or more hours	15489 (26.03)	6124 (20.89)	3880 (25.84)	5485 (36.13)	

* the 'n' shows adjusted frequencies for each variable
* the % depicts adjusted probabilities

Table 11: Descriptive characteristics for the family and community characteristics stratified by presence of ACE using the NSCH, 2016-2018

	Total sample	Adverse Childhood Experiences			
	(n=59,504) n (%)	No ACE (n=29,311) n (%)	One ACE (n=15,011) n (%)	More than two ACEs (n=15,181) n (%)	P-value
Level of education of parent					<0.001
High school/GED or less	17365 (29.18)	6970 (23.78)	4864 (32.40)	5530 (36.43)	
Some college/technical school	13510 (22.70)	5138 (17.53)	3703 (24.67)	4668 (30.75)	
College or higher	28629 (48.11)	17202 (58.69)	6444 (42.93)	4982 (32.82)	
Health status of parent					<0.001
Fair/poor	944 (1.59)	57 (0.19)	123 (0.82)	764 (5.03)	
Excellent	55670 (93.56)	28689 (97.88)	14125 (94.10)	12855 (84.68)	
No parent reported in household	2890 (4.86)	565 (1.93)	763 (5.08)	1561 (10.29)	
Adult smoker in household					<0.001
No	50112 (84.22)	26425 (90.16)	12556 (83.64)	11129 (73.31)	
Yes	9392 (15.78)	2886 (9.84)	2455 (16.36)	4052 (26.69)	
Usual source of care					<0.001
No	13524 (22.73)	6015 (20.52)	3831 (25.52)	3679 (24.23)	
Yes	45980 (77.27)	23296 (79.48)	11180 (74.48)	11502 (75.77)	
Received needed health care					<0.001
No	2235 (3.76)	376 (1.28)	538 (3.58)	1321 (8.70)	
Yes	57269 (96.24)	28935 (98.72)	14473 (96.42)	13860 (91.30)	
Received preventive health visit					0.1775
No	15736 (26.45)	8013 (27.34)	3971 (26.45)	3752 (24.71)	
Yes	43768 (73.56)	21298 (72.66)	11040 (73.55)	11429 (75.29)	
Adolescent shares ideas with parents					<0.001
Somewhat/not very well	20822 (34.99)	8880 (30.30)	5490 (36.57)	6452 (42.50)	

Very well	38682 (65.01)	20431 (69.70)	9521 (63.43)	8729 (57.50)	
Afford nutritious meal					<0.001
Could always afford	40391 (67.88)	24539 (83.72)	9481 (63.16)	6369 (41.96)	
Could afford but non-nutritious	15708 (26.40)	4624 (15.78)	4615 (30.74)	6469 (42.61)	
Sometime/often could not afford	3405 (5.72)	147 (0.50)	915 (6.10)	2343 (15.43)	
Type of insurance					<0.001
Private only	36430 (61.22)	21304 (72.68)	8914 (59.38)	6211 (40.91)	
Public only	16421 (27.60)	5309 (18.11)	4089 (27.24)	7023 (46.26)	
Multiple	2762 (4.64)	803 (2.74)	932 (6.21)	1027 (6.76)	
Uninsured	3891 (6.54)	1895 (6.46)	1076 (7.17)	920 (6.06)	
Adverse childhood experience					-
No ACE	29311 (49.26)	29311 (49.26)	0 (0)	0 (0)	
At least 1 ACE	15011 (25.23)	0 (0)	15011 (25.23)	0 (0)	
More than 2 ACEs	15181 (25.51)	0 (0)	0 (0)	15181 (25.51)	
Extracurricular activities					<0.001
No	10458 (17.58)	4144 (14.14)	2655 (17.69)	3659 (24.10)	
Yes	49046 (82.42)	25167 (85.86)	12356 (82.31)	11522 (75.90)	
Safe and supportive neighborhood					<0.001
No	2700 (4.54)	667 (2.28)	571 (3.80)	1462 (9.63)	
Yes	56804 (95.46)	28644 (97.72)	14440 (96.20)	13719 (90.37)	
Safe school					<0.001
No	1692 (2.84)	305 (1.04)	434 (2.89)	952 (6.27)	
Yes	57812 (97.16)	29006 (98.96)	14577 (97.11)	14229 (93.73)	

* the 'n' shows adjusted frequencies for each variable

* the % depicts adjusted probabilities

Table 12: Descriptive for the physical and mental health outcomes stratified by presence of ACE using the NSCH, 2016-2018

	Total sample	**Adverse Childhood Experiences**			
		None	One ACE	More than two ACEs	P-value
	(n=59,504)	(n=29,311)	(n=15,011)	(n=15,181)	
	n (%)	n (%)	n (%)	n (%)	
Presence of Mental/ Emotional/Behavioral/ Developmental Problem					<0.001
No	40762 (68.50)	22432 (76.53)	10329 (68.81)	8000 (52.70)	
Yes	18742 (31.50)	6879 (23.47)	4682 (31.19)	7181 (47.30)	
Health Status of Adolescent					<0.001
Good/Fair/Poor	6742 (11.33)	2099 (7.16)	1671 (11.13)	2972 (19.58)	
Very good/Excellent	52762 (88.67)	27212 (92.84)	13340 (88.87)	12209 (80.42)	
Mental toughness/ Flourishing behavior					<0.001
Usually/Sometime/Never	41527 (69.79)	18882 (64.42)	10751 (71.62)	11893 (78.34)	
Always	17977 (30.21)	10429 (35.58)	4260 (28.38)	3288 (21.66)	

* the 'n' shows adjusted frequencies for each variable
* the % depicts adjusted probabilities

Table 13: Association of the individual, family, and community characteristics with physical and mental health outcomes among adolescents using the NSCH, 2016-2018

	Presence of Mental/Emotional/ Behavioral/Developmental Problem	**Health Status of Adolescent**	**Mental toughness/ Flourishing behavior**
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Individual Characteristics			
Age category			
10-13 years	1.00 (-)	1.00 (-)	1.00 (-)
14-17 years	1.00 (0.90, 1.11)	0.98 (0.81, 1.19)	1.53 (1.38, 1.70))***
Sex			
Male	1.00 (-)	1.00 (-)	1.00 (-)
Female	0.69 (0.62, 0.76)***	1.03 (0.86, 1.23)	1.19 (1.08, 1.32))***
Race/Ethnicity			
Non-Hispanic White	1.00 (-)	1.00 (-)	1.00 (-)
Hispanic	0.70 (0.59, 0.82))***	0.76 (0.59, 0.96)*	1.35 (1.16, 1.58))***
Black	0.62 (0.51, 0.74))***	0.86 (0.66, 1.14)	1.17 (0.99, 1.40)
Asian	0.33 (0.25, 0.43))***	0.72 (0.51, 1.01)	1.76 (1.37, 2.25))***
American Indian/Alaskan Native/Native Hawaiian/Pacific Islander	0.74 (0.62, 0.87))***	1.30 (0.98, 1.72)	1.17 (0.98, 1.41)
Amount of physical activity (at least 60 minutes/week)			
0 days	1.00 (-)	1.00 (-)	1.00 (-)
1-3 days	0.69 (0.58, 0.82))***	1.56 (1.25, 1.94))***	1.33 (1.08, 1.64)**
4-6 days	0.55 (0.45, 0.67))***	2.64 (2.02, 3.46))***	1.77 (1.43, 2.19))***
Everyday	0.58 (0.48, 0.72))***	2.48 (1.78, 3.45))***	2.01 (1.60, 2.53))***
Screen time per day (TV/mobile/computer/video games)			
0-1 hours	1.00 (-)	1.00 (-)	1.00 (-)
2-3 hours	1.16 (1.03, 1.31)**	1.01 (0.77, 1.32)	0.60 (0.53, 0.68))***

4 or more hours	1.33 (1.15, 1.55))***	0.93 (0.72, 1.21)	0.47 (0.40, 0.56))***
Body mass index			
Normal (5th-84th percentile)	1.00 (-)	1.00 (-)	1.00 (-)
Underweight (<5th percentile)	1.22 (1.00, 1.49)*	0.57 (0.42, 0.79))***	0.85 (0.69, 1.06)
Overweight (85th-94th percentile)	1.01 (0.87, 1.18)	0.70 (0.53, 0.91)**	1.02 (0.87, 1.19)
Obese (>95th percentile)	1.16 (0.99, 1.36)	0.39 (0.31, 0.48))***	0.90 (0.76, 1.06)
Family Characteristics			
Level of education of parent			
High school/GED or less	1.00 (-)	1.00 (-)	1.00 (-)
Some college/technical school	1.10 (0.94, 1.28)	1.16 (0.94, 1.43)	0.90 (0.76, 1.05)
College or higher	1.30 (1.11, 1.52))***	1.41 (1.08, 1.85)**	0.95 (0.81, 1.12)
Health status of parent			
Fair/poor	1.00 (-)	1.00 (-)	1.00 (-)
Excellent	0.51 (0.35, 0.75))***	1.99 (1.29, 3.05)**	1.75 (0.99, 3.08)
No parent reported in household	0.51 (0.33, 0.79)**	1.61 (0.93, 2.79)	2.02 (1.08, 3.80)
Adult smoker in household			
No	1.00 (-)	1.00 (-)	1.00 (-)
Yes	1.39 (1.18, 1.64))***	0.98 (0.80, 1.21)	0.69 (0.59, 0.81))***
Usual source of care			
No	1.00 (-)	1.00 (-)	1.00 (-)
Yes	1.28 (1.10, 1.50))***	0.82 (0.64, 1.05)	0.85 (0.74, 0.99)**
Received needed health care			
No	1.00 (-)	1.00 (-)	1.00 (-)
Yes	0.51 (0.38, 0.70))***	1.89 (1.37, 2.62))***	3.36 (2.40, 4.71))***
Received preventive health visit			
No	1.00 (-)	1.00 (-)	1.00 (-)
Yes	1.52 (1.32, 1.75))***	0.66 (0.52, 0.84))***	1.11 (0.97, 1.26)
Adolescent shares ideas with parents			
Somewhat/not very well	1.00 (-)	1.00 (-)	1.00 (-)
Very well	0.52 (0.47, 0.58))***	1.82 (1.52, 2.17))***	3.28 (2.93, 3.66))***

Afford nutritious meal			
Could always afford	1.00 (-)	1.00 (-)	1.00 (-)
Could afford but non-nutritious	1.06 (0.93, 1.21)	0.68 (0.55, 0.84))***	0.72 (0.62, 0.83))***
Sometime/often could not afford	1.36 (1.03, 1.80)*	0.53 (0.35, 0.81)**	0.89 (0.65, 1.21)
Type of insurance			
Private only	1.00 (-)	1.00 (-)	1.00 (-)
Public only	1.14 (0.98, 1.33)	0.53 (0.43, 0.66))***	0.79 (0.66, 0.93)**
Multiple	1.62 (1.28, 2.06))***	0.35 (0.26, 0.47))***	0.92 (0.71, 1.18)
Uninsured	0.87 (0.63, 1.18)	0.76 (0.54, 1.07)	0.90 (0.68, 1.20)
Extracurricular activities			
No	1.00 (-)	1.00 (-)	1.00 (-)
Yes	0.64 (0.55, 0.76))***	1.29 (1.04, 1.60)*	1.42 (1.18, 1.71))***
Community Characteristics			
Adverse childhood experience			
No ACE	1.00 (-)	1.00 (-)	1.00 (-)
At least 1 ACE	1.28 (1.12, 1.46))***	1.01 (0.79, 1.30)	0.90 (0.80, 1.02)
More than 2 ACEs	2.07 (1.79, 2.38))***	0.79 (0.62, 1.02)	0.80 (0.69, 0.93))**
Safe and supportive neighborhood			
No	1.00 (-)	1.00 (-)	1.00 (-)
Yes	1.14 (0.82, 1.58)	1.64 (1.02, 2.64)*	0.74 (0.48, 1.14)
Safe school			
No	1.00 (-)	1.00 (-)	1.00 (-)
Yes	0.46 (0.34, 0.62))***	2.09 (1.40, 3.11))***	1.98 (1.39, 2.81))***

* p-value <0.05
** p-value <0.01
*** p-value <0.001

Figure 6: Two-way plot to demonstrate the adjusted odds ratio for mental health status among adolescents due to individual characteristics using the NSCH, 2016-2018

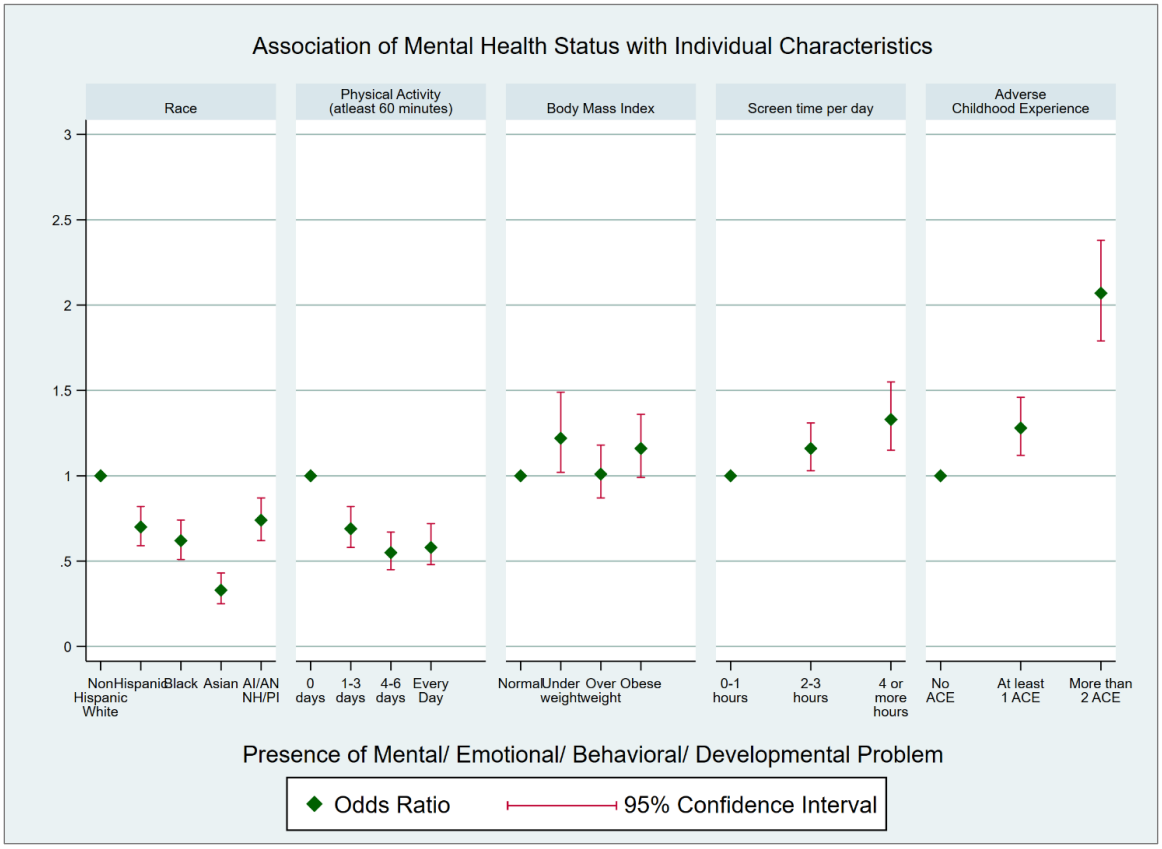
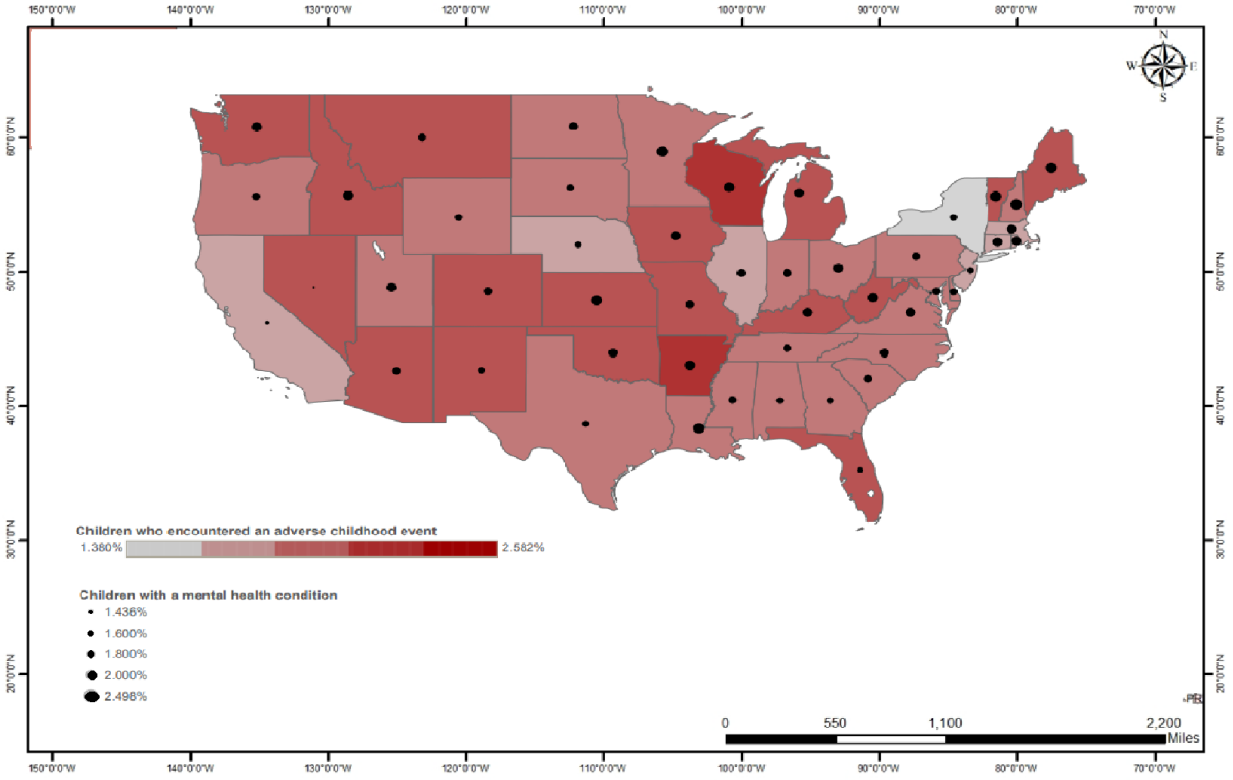


Figure 7: State-wise distribution of adolescents with more than 1 ACE with the presence of mental health problems using the NSCH, 2016-2018



CHAPTER 6: DISCUSSION

SUMMARY OF FINDINGS

The three studies conducted as a part of this dissertation examined three essential aspects of mental health and its service utilization. The first and third studies utilized data from the NSCH, 2016-2018 which is sponsored by the Maternal and Child Health Bureau of the Health Resources and Services Administration, Department of Health and Human Services. The second study used data from the NHANES, 2015-2018, which is a major program of the National Center for Health Statistics. NCHS is part of the Centers for Disease Control and Prevention and has the responsibility for producing vital and health statistics for the nation. Each of these three independent studies addressed questions for the prevalence of mental illnesses and adequate mental health service utilization, access to appropriate care when needed, among both pediatric, adolescent, and geriatric age groups. One of the most important goals of this dissertation was to provide evidence and guidance to healthcare systems and policymakers to design targeted strategies and interventions.

This dissertation helps fill some information gaps in the domain of mental health and its service utilization. Also, the findings focused on the barriers, both financial and non-financial along with disparities for mental health service utilization among children and elderly which may help inform programs specific to each barrier to reduce mental health stigma, improve access, and delivery. Moreover, we describe the associations between family, neighborhood, community, and school environment on one hand, and physical and mental health outcomes among adolescents on the other. Henceforth, we validate several hypotheses of how mental health is impacted by plural domains and provide additional evidence to support the theoretical frameworks. Moreover, the findings elaborate on the existing literature on mental health service utilization.

The first study described the financial and non-financial barriers to mental health service utilization and academic outcomes among children below the age of 18 years. Apart from the national and state-level policies, the findings from this study can help design programs to improve discussion around mental health and service utilization at school levels as well. School-based services can directly impact mental health as well as the academic performance of a child.

Past research has shown several barriers to adequate mental health service utilization; however, the focus has largely been on adult populations. We used multi-year NSCH data to examine the financial and non-financial barriers that impact mental health service utilization and academic outcomes among children below 18 years of age. We hypothesized that children are less likely to receive adequate mental health services due to poor insurance coverage and racial disparity. Also, children display low academic performance if their parents have poor physical or mental health and have difficulty accessing healthcare when needed. Pearson chi-square test was used for descriptive analyses to measure the utilization of behavioral therapy for Autism/ASD or ADHD/ADD among children. Multivariable logistic regression was used to estimate the factors that predict mental health utilization measured as receiving treatment from a mental health provider, taking prescription drugs, and behavioral therapy. These factors were combined in a single regression model to estimate the cumulative effect and were divided into predisposing, enabling, need factors based on the Anderson Health Behavior Model. All analyses were analyzed at a significance level of ≤0.05.

Across three years of data from 2016-2018, 12,297 children had a diagnosis of Autism/ASD or ADHD/ADD where 7.1% did not receive care from a mental health professional, 44.2% did not take prescriptions drugs, and 51.2% did not receive behavioral therapy for their diagnosis. Behavioral therapy is used as the cornerstone

treatment for these mental health diagnoses among children and hence, was of utmost importance for us in the analyses. Among the children who did not receive behavioral therapy, 67% were males, 53.4% were covered under private insurance only, 10% had an insurance plan which did not cover needed mental health services, 51.2% had a parent with fair/poor health status, and 16% had difficulty receiving care from a mental health professional. Also, among these children, 69.4% had missed more than one school day and 13% had repeated grades.

We found statistically significant higher odds of not utilizing prescription drugs for diagnoses of Autism/ASD or ADHD/ADD among Hispanics and Asian children in comparison to non-Hispanic Whites. Also, the parents of children who had difficulty obtaining care from a mental health professional had lesser odds of utilizing mental health services for their children, while their children had higher odds of missing school days. The children covered under public insurance only and those with insurance whose benefits never meet their needs had higher odds of repeating grades. Therefore, there is a dire need for better insurance policies and coverage plans to ensure adequate access and delivery of mental health services.

The second study focused on the disparities in mental health utilization among the elderly with depression or anxiety. Also, we examined the utilization behaviors among the elderly with underlying chronic illness and consequent prescription drug compliance. The findings from this study may help inform targeted interventions to reduce specific disparities such as racial discrimination, insurance coverage, citizenship status, etc. Moreover, the findings showing compliant behaviors for prescription drugs for physical and mental health can be useful for media campaigns and social awareness to promote such behaviors and eventually improved health outcomes among the elderly.

Similar to the first study, the second study investigated the factors leading to disparities for mental health service utilization among the elderly classified as predisposing, enabling, and need factors based on the Anderson Health Behavior Model. The NHANES data from 2015-2018 showed 2,476 elderlies above the age of 60 years who had reported depression or anxiety. Pearson Chi-square test was used for descriptive analysis and multivariable logistic regression was used to estimate the factors that predict mental health utilization which was measured as receiving treatment from a mental health provider and taking prescription drugs. We hypothesized that racial disparity is the most significant reason for poor health care utilization and the elderly who have a compliant behavior with general health services are more likely to utilize mental health services as well. Racial discrimination marks a profound impact on the overall health status of individuals of all ages (Elias & Paradies, 2016; Heard-Garris, Cale, Camaj, Hamati, & Dominguez, 2018; Paradies et al., 2015). The discrimination further adds to the stigma which is one of the most important barriers to mental health care seeking (Alang, 2015; Narendorf & Palmer, 2016; Waitzfelder et al., 2018).

Among the 2,476 elderlies, 58.6% were females, 91.5% did not see a mental health provider and 75% did not take prescription drugs for depression or anxiety. 90% of Blacks, 90% Hispanics, and 96% Asians did not see mental health providers after feeling depressed or anxious. Moreover, 93.8% of Asians did not take prescription drugs for the same. The regression model showed fewer odds of seeing a mental health provider among Asians and fewer odds of using prescription drugs for mental illness among Blacks, Hispanics, and Asians in comparison to non-Hispanic Whites. The individuals covered under Medicaid had higher odds of utilizing mental health services. A unique and interesting finding in the regression model showed higher odds of using prescription medicine among US citizens and lesser odds among English speakers.

To better understand these findings, we analyzed two separate post-regression models in which we adjusted the interaction term between citizenship, race, and language, respectively (DiD model). To improve the interpretability of interaction terms in the non-linear model, we converted estimates to average marginal outcomes using the 'margins' command (Stata Corp, n.d.). However, the results did not show any statistical significance. We found that the elderly who were compliant with prescription drugs for underlying hypertension were more likely to be compliant with prescription medication for mental illness. Thereby, targeted programs are needed to reduce racial disparity and stigma and promote complaint behavior among the elderly.

The third study demonstrates the ecology of physical and mental health outcomes among adolescents by understanding several factors at the individual, family, and community levels using the Social Ecological Model. The findings demonstrate the importance of social constructs in impacting health outcomes among young minds. The findings from this study will help initiate new programs at the state level to make holistic changes in the quality of the social environment.

We used multi-year NSCH data to describe the ecology of mental health and health outcomes in various domains. Pearson Chi-square test was used for descriptive analyses to calculate frequencies and multivariable logistic regression was used to estimate the cumulative effect of multiple factors on the health outcomes of adolescents. Across 2016-2018 data, 59,504 adolescents were identified in the age group of 10-17 years. We hypothesized that ACE's, the health status of parents, physical activity, parent-adolescent relationship, and social environment impact the overall physical and mental health outcomes and mental toughness among adolescents.

More than 50% of the adolescents were physically active for at least 60 minutes for less than three days. Approximately 37% of adolescents had an abnormal BMI

(underweight, overweight, and obese). The AAP provides guidelines to limit screen time among children to not more than 2 hours. However, our findings showed more than 70% of the adolescents with screen time of more than 2 hours including 26% with screen time of more than 4 hours. 15.8% of the adolescents lived in a household with an adult smoker, 26.5% did not receive preventive health care visits, 35% did not share ideas with a parent, more than 50% had at least one ACE including 25% with more than two ACE's. 31.5% of the adolescents had a mental/emotional/behavioral/developmental problem and almost 70% sometimes or never showed mental toughness or flourishing behavior.

The studies in the past focused on individual factors and did not provide estimates for the cumulative effect of the social constructs on the health outcomes of adolescents. We used a single multivariable regression model to analyze the aggregate effect of factors in multiple domains. The regression model showed that Hispanic, Black, Asian and AI/AN/NH/PI racial groups had fewer odds of having mental/emotional problems. Adolescents with more amount of physical activity had higher odds of better health status and mental toughness. Also, adolescents with a screen time of more than 2 hours were more likely to have mental/emotional problems and fewer odds of mental toughness/flourishing behavior.

Adolescents with parents with excellent health status were less likely to have behavioral problems and more likely to have better health status. A good parent-adolescent relationship was described if the adolescent shared ideas or talked to a parent about things that matter. A good relationship was associated with higher odds of better health status and mental toughness among adolescents. The adolescents who had ACEs had higher odds of mental/emotional/behavioral problems and fewer odds of

mental toughness. Also, the adolescents living in a safe neighborhood and going to a safe school had higher odds of better overall health status.

CONTRIBUTION TO LITERATURE

Previous studies have explained the barriers and disparities to mental health service utilization; however, the focus has mainly been laid on the adult population. The individuals among pediatric, adolescent, and geriatric age groups present with unique mental illnesses and distinct barriers to appropriate utilization. Children/adolescents under the age of 18 are dependent on a parent/guardian/caregiver for healthcare which could posit different types of hurdles in accessing and receiving adequate services. The researchers in the past have focused on individual barriers and have not considered the aggregate effect of all factors combined in a single model. To the best of our knowledge, no other study has shown recent multi-year national level estimates to describe the barriers and disparities among pediatric and geriatric populations with a diagnosis of mental health condition. Moreover, no other study has shown the concurrent impact of individual, family, neighborhood, and school characteristics on the physical and mental health of adolescents.

The first study makes a unique contribution by expanding knowledge on financial and non-financial barriers to mental health service utilization along with academic achievements among children with Autism/ASD/ADHD/ADD. Moreover, no other study has measured mental health service utilization in terms of seeing a mental health provider, taking prescription medication, and behavioral therapy, in the same analytical model. The results from the second study provide a distinct and new set of estimates to describe the disparities among the elderly with depression/anxiety and underlying comorbidities for mental health service utilization. The study is the first to demonstrate

the association of compliant behavior for prescription medication for chronic diseases and mental illness. The third study is unique by being the first to demonstrate the concurrent impact of individual, family, and community characteristics on the health outcomes of adolescents. Also, it is the first study to use the social-ecological model to demonstrate the association of multiple characteristics with overall health outcomes and mental toughness.

This dissertation is the first to map state-wise distribution to illustrate the barriers to receive care from a mental health provider due to inadequate insurance benefits for needed mental health services. Also, we map the states with adolescents who had one or more ACEs and the presence of mental health problems. Thereby, these maps will help identify problem areas and design state-specific programs and strategies to improve mental health care access and delivery.

POLICY IMPLICATIONS AND RECOMMENDATIONS

Socio-political reforms like MHPAE and ACA have offered opportunities for individuals with mental illness to gain better insurance coverage for needed services, prescription drugs, etc. In addition to medical care, research has shown that factors such as education, income, and quality of the neighborhood and social environments play a vital role in impacting health outcomes (Smedley & Syme, 2000). A long and healthy life would thereby lead to higher work productivity, reduced healthcare expenditures, and an increase in revenues on a national scale. Being educated and health literate provides opportunities for better health. A higher level of education generally correlates with better employability and associated benefits such as health insurance. Moreover, with higher education, comes an understanding to invest in nutritious food, provide a secure

childhood, encourage activities to reduce mental stress or burden, and live in a safe and healthy neighborhood with necessary amenities (Shonkoff, Boyce, & McEwen, 2009).

Children who are deprived of quality care and education have a higher risk of turning into unhealthy adults. Given the amount of time a child spends in school, policymakers should target interventions to monitor the functioning of school-based services. Society as a whole should work towards creating suitable conditions to help people around them make healthier choices. The influential people in the society can help provide incentives and thereby reduce barriers to improve healthcare access and delivery.

Also, we would like to lay out some recommendations for health care providers and policymakers with an aim to improve mental healthcare access and delivery along with removing misconceptions regarding mental health among society. Good mental health should be promoted at both micro and macro levels. The micro levels lay focus on factors associated with high-risk individuals and families whereas the macro-level stresses advocacy, policy, and social reforms. The inherent values such as spirituality, identity, values and belief system, level of education, and religious leadership, should be targeted to design strategies and programs. This would directly help in reducing stigma and fear related to the use of mental health services in the community. Moreover, ‘health homes’ can be designed specifically for the elderly for better coordination of medical and mental care in a holistic manner.

More rigorous efforts are warranted to foster awareness for mental health conditions and help-seeking. Educational initiatives need to be launched to reduce disparity among vulnerable populations along with a shift in dialogue to answer questions and remove myths around mental health. Expanded investment in partnership with the community like faith-based organizations, local clubs, etc., would help create

trustworthy and culturally relevant networks and help overpower care-seeking barriers. More targeted strategies are needed to control screen time among the pediatric age group along with an increased time for physical activity. Parents or caretakers need to be made aware of the benefits of reduced screen time and help them set rules at home through media campaigns and social awareness. AAP guidelines recommend strategies focused on patient-centered communication and motivational interviewing, considering the patients' readiness for behavior change such as shared decision making, parental skills training, food monitoring, and regular follow-up visits (Barlow & Expert Committee, 2007).

More school-based programs around physical activity need to be launched in addition to community-level initiatives. Developing basic amenities such as sidewalks, bike trails, playgrounds, etc., and encouraging local farmer's markets to provide easy access to nutritional food are essential to a neighborhood. Interventions like providing a healthier school lunch environment, displaying nutritional content of food in restaurants, and correct nutrition labeling, would help spread knowledge about nutritious food options.

Several prevention and control programs for obesity have been implemented at the state and local levels. The CDC (2021b) funded 16 state programs to encourage healthy eating and physical activity. The state of Nebraska implemented Snack and Go intervention to helps customers identify healthier snacks options in retail food stores. The state of Michigan provided grants to local health departments to improve community environments by increasing access to nutritious food and neighborhood amenities. Some other local policy initiatives included developing community gardens, walking campaigns, and increased availability of fresh produce at gas stations and convenience

stores. Let's move! Child Care (LMCC) initiative in Alaska provides strategies to help young children be more active and eat healthier.

In addition to targeting mental health, interventions at the community level are essential to reduce disparities (Wiggins, 2012). School-based mental health services and interventions should play a vital role in reducing inequity. Interventions should be targeted specifically towards promoting better behavior and academic achievements to address indirect means of mental health disparities. Moreover, inculcating correct values is the responsibility of both the family and the school system. Policies are needed to increase access to mental health services in schools which would help teachers better manage their students with behavioral problems and prevent/reduce disparities at an early level. The most important intervention at the school level is to mandate schools to offer nutritious food only. The vending machines in school facilities should not serve as an easy source of junk snacks. The meals provided in schools should meet the Dietary Guidelines set by the DHHS (2005).

Health care providers need to be trained to be more culturally sensitive and pay special consideration to adolescents who have adverse experiences of discrimination by incorporating strategies to involve family communication into routine clinical practice. Religious leaders play a key role in shaping the minds of people who have strong faith in them and should be looped in to design targeted strategies around spreading awareness to create safe neighborhoods and include healthy food habits in lifestyle. Moreover, strategies are needed to identify adolescents and families who are at risk for ACEs. Trauma-informed interventions should be designed to focus on fostering parent-child relationships and promoting positive development despite adversity. Collaborative partnerships and interprofessional practice with primary care providers would help improve mental health screening, referral, and treatment.

Behavioral compliance (change behavior based on medical advice/management plan) should be encouraged instead of standard compliance (improved clinical outcomes based on clinical and laboratory investigations). Compliance aids like blister packs, dosage counters, controlled-delivery devices, and metered dosage can be provided for patients who tend to forget to take their medication. In addition to the role of physicians, pharmacists have similar responsibilities in counseling patients and improving compliance to prescription medicines.

Telehealth services are a great opportunity to reduce the disparities in mental health service utilization. About 11% of people across the US used telehealth services in 2019 which spiked to 46% in 2020 (Bestsennyy, Gilbert, Harris, & Rost, 2020). Telemental health services need to be promoted to address the barriers to adequate and equitable care. Virtual appointments can help reduce several direct and indirect barriers such as lack of transportation, inability to take time off work, finding childcare, long wait times, language, race/ethnicity, age, gender, location (urban/rural), etc., which delay mental healthcare seeking during in-person provider visits. Telehealth would empower mental health providers to offer services in underprivileged or rural areas. People from some cultures avoid visiting mental health providers due to underlying beliefs, stigma, shame, or loss of face. Telemental health services would allow these people to obtain treatment in the comfort of their homes without the fear of coming out in front of everyone.

LIMITATIONS

Despite the prominent strengths of the first study, the findings should be interpreted in light of some limitations. NSCH being a survey data, did not provide information on reasons which influenced the parental/caregiver decisions for utilizing

mental health services. Moreover, being a cross-sectional type of data, it was not possible to analyze the causal relationship between multiple factors studied. The survey responses were parental reports of the child's health care status, mental health diagnosis, eventual service utilization, and academic performance. The NSCH data collection methodology does not verify the parental report of medical conditions from electronic medical records. Moreover, there is a chance that parental reports might be not correct due to underlying beliefs, biases, fear, and stigma about mental health. However, there is evidence that parental reports are considered trustworthy for data analysis (CDC, 2006).

The findings from the second study should be interpreted in the context of some limitations. Being cross-sectional data, it was not possible to demonstrate the causal relationship between multiple factors studied to describe health disparities among the elderly with a mental health condition. As NHANES is a survey data, the possibility for the elderly to report their medical conditions inaccurately cannot be negated in the case of underlying dementia due to age. Also, there is a chance of recall bias among this population. However, the prescription drugs were inspected by the interviewers personally by checking the drug containers/strips during the interview and data collection process (NHANES, 2020).

Similar to the first study, the third study used NSCH data and presented with the same limitations. However, as the focus was specific to adolescents during this study, there were some unique limitations as well. As NSCH uses parental reporting of the health status of adolescents, the adolescent's version of their health conditions might change the findings. This opens the scope for future research where survey data should be collected directly based on the adolescents' report of their physical and mental health

status as well and comparison studies can stress the disparities between parental and adolescent reporting of health status and utilization.

FUTURE RESEARCH

The MHPAE and ACA introduced policy reforms to improve mental health care delivery, and hence more focused research using longitudinal data is warranted to assess causal relationships between different factors. In addition to the parental reports for adolescent health, surveys should be conducted to gather adolescents' perspectives on their health and social constructs. Comparisons should be made between parental survey responses and those from adolescents to understand any discrepancies. This would allow the implementation of more targeted strategies specific to the needs of both, the parents, and the adolescents.

With the expected imminent changes in health policies under the administration of President Biden, future research should focus on monitoring changes in mental health service utilization across primary and specialty care. Also, focused qualitative research should be conducted to understand the first-hand perspectives of primary care providers, psychiatrists, psychologists, nurses, social workers, and other healthcare providers who manage patients with mental illness across all age groups. Opinions from the providers will further strengthen the targeted interventions and strategies.

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APPENDIX-A

Table 14: Association of the non-financial and financial barriers with mental health service utilization and academic outcomes using the NSCH, 2016-2018 (Sensitivity analysis I)

	Did not receive treatment from mental health professional	**Did not take prescription medicine for Autism/ASD/ADHD/ADD**	**Did not take behavioral therapy for Autism/ASD/ADHD/ADD**	**Missed school days**	**Repeated grades**
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Age category					
3-7 years	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
8-12 years	0.89 (0.51, 1.56)	0.31 (0.23, 0.41)***	1.26 (0.92, 1.72)	3.16 (2.32, 4.31))***	2.55 (1.41, 4.61))***
13-17 years	0.55 (0.31, 0.99)*	0.35 (0.26, 0.47))***	2.35 (1.72, 3.23))***	3.32 (2.45, 4.50))***	4.15 (2.31, 7.45))***
Sex					
Male	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
Female	1.39 (0.91, 2.13)	1.06 (0.86, 1.30)	1.65 (1.31, 2.08))***	1.11 (0.88, 1.39)	0.70 (0.52, 0.95)*
Race/Ethnicity					
Non-Hispanic White	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
Hispanic	1.42 (0.83, 2.46)	2.20 (1.64, 2.94))***	0.92 (0.66, 1.27)	0.88 (0.65, 1.20)	1.05 (0.69, 1.59)
Black	1.08 (0.52, 2.27)	0.92 (0.65, 1.30)	0.75 (0.52, 1.08)	0.64 (0.47, 0.88)**	1.42 (0.98, 2.05)
Asian	1.36 (0.45, 4.08)	5.18 (2.85, 9.43))***	0.43 (0.21, 0.88)*	1.15 (0.63, 2.08)	0.82 (0.41, 1.64)
American Indian/Alaskan Native/Native Hawaiian/Pacific Islander	0.57 (0.31, 1.05)	1.05 (0.78, 1.41)	0.90 (0.66, 1.23)	0.92 (0.64, 1.31)	1.13 (0.75, 1.72)
Level of education of parent					

High school/GED or less	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
Some college/technical school	0.71 (0.42, 1.18)	1.21 (0.90, 1.62)	0.84 (0.61, 1.16)	1.36 (1.02, 1.80)*	0.90 (0.64, 1.28)
College or higher	0.38 (0.22, 0.66))***	0.98 (0.72, 1.32)	0.83 (0.60, 1.15)	1.16 (0.85, 1.58)	0.63 (0.43, 0.94)*
Type of insurance					
Private only	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
Public only	0.72 (0.42, 1.25)	0.97 (0.72, 1.30)	0.75 (0.55, 1.02)	0.90 (0.67, 1.21)	2.10 (1.52, 2.91))***
Multiple	0.60 (0.29, 1.25)	1.05 (0.74, 1.47)	0.64 (0.44, 0.92)*	1.08 (0.78, 1.50)	1.77 (1.18, 2.65)**
Uninsured	0.01 (0.002, 0.10))***	0.41 (0.13, 1.32)	0.50 (0.03, 7.34)	1.83 (0.64, 5.25)	1.43 (0.48, 4.28)
Non-financial Barriers					
Health status of parent					
Excellent	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
Fair/poor	1.33 (0.83, 2.12)	0.86 (0.70, 1.06)	1.09 (0.86, 1.38)	1.33 (1.06, 1.68)*	1.10 (0.82, 1.48)
No parent reported in household	0.72 (0.33, 1.58)	0.67 (0.45, 0.98)	1.04 (0.67, 1.62)	1.03 (0.68, 1.57)	1.19 (0.78, 1.83)
Level of difficulty in obtaining care from mental health professional					
Child did not need mental health care	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
Not difficult	284.31 (105.59, 765.58))***	0.52 (0.40, 0.67))***	0.26 (0.20, 0.34))***	0.82 (0.63, 1.08)	0.95 (0.66, 1.37)
Somewhat/very difficult	1653.18 (603.89, 4525.70))***	0.68 (0.51, 0.91))**	0.36 (0.27, 0.49))***	1.24 (0.88, 1.76)	0.84 (0.56, 1.25)
Level of difficulty in obtaining a referral					
Child did not need referral	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
Not difficult	0.62 (0.38, 1.00)	1.08 (0.85, 1.37)	0.76 (0.59, 0.98)*	1.29 (1.00, 1.67)*	1.17 (0.85, 1.62)

Somewhat/very difficult	0.64 (0.37, 1.11)	0.74 (0.50, 1.08)	0.53 (0.35, 0.81))***	2.44 (1.63, 3.66))***	1.44 (0.91, 2.26)
Financial Barriers					
Out of pocket cost of health care					
Less than $999	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
$1000-$5000	1.28 (0.73, 2.25)	0.67 (0.51, 0.87))***	0.90 (0.67, 1.21)	1.14 (0.87, 1.49)	1.39 (0.91, 2.13)
More than $5000	0.53 (0.22, 1.27)	0.87 (0.54, 1.39)	0.64 (0.35, 1.17)	0.74 (0.36, 1.52)	1.09 (0.59, 2.01)
Insurance benefits meet child's health needs					
Always/usually	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
Sometimes/never	1.71 (0.90, 3.24)	0.92 (0.57, 1.47)	1.16 (0.72, 1.86)	1.16 (0.74, 1.83)	2.18 (1.11, 4.30)*
Uninsured	12.20 (2.17, 68.51))***	2.43 (0.78, 7.55)	0.85 (0.06, 12.90)	0.34 (0.13, 0.94)*	1.37 (0.48, 3.89)
Insurance plan covers needed mental health services					
Always/usually	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
Sometimes/never	1.49 (0.85, 2.62)	1.53 (1.09, 2.14)*	1.09 (0.77, 1.57)	0.84 (0.60, 1.19)	0.60 (0.36, 1.00)*
Uninsured	17.15 (9.51, 30.93))***	1.76 (1.35, 2.30))***	3.47 (2.66, 4.54))***	0.80 (0.62, 1.03)	0.76 (0.52, 1.10)

* p-value <0.05
** p-value <0.01
*** p-value <0.001

APPENDIX-B

Table 15: Association of the non-financial and financial barriers with mental health service utilization and academic outcomes using the NSCH, 2016-2018 (Sensitivity analysis II)

	Did not receive treatment from mental health professional	**Did not take prescription medicine for Autism/ASD/ADHD/ADD**	**Did not take behavioral therapy for Autism/ASD/ADHD/ADD**	**Missed school days**	**Repeated grades**
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Age category					
3-7 years	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
8-12 years	0.88 (0.51, 1.52)	0.31 (0.23, 0.41))***	1.28 (0.95, 1.73)	3.05 (2.26, 4.13))***	2.50 (1.40, 4.48))***
13-17 years	0.62 (0.35, 1.08)	0.34 (0.25, 0.45))***	2.16 (1.59, 2.92))***	3.18 (2.37, 4.27))***	4.05 (2.27, 7.20))***
Sex					
Male	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
Female	1.36 (0.92, 2.03)	1.04 (0.85, 1.28)	1.57 (1.25, 1.97))***	1.10 (0.87, 1.37)	0.70 (0.52, 0.94)*
Race/Ethnicity					
Non-Hispanic White	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
Hispanic	1.30 (0.78, 2.15)	2.29 (1.70, 3.07))***	1.03 (0.74, 1.42)	0.90 (0.66, 1.22)	1.05 (0.69, 1.61)
Black	1.13 (0.56, 2.26)	0.91 (0.65, 1.28)	0.73 (0.52, 1.04)	0.65 (0.47, 0.89)**	1.43 (0.99, 2.05)
Asian	1.25 (0.44, 3.52)	5.31 (2.88, 9.79))***	0.50 (0.26, 0.94)*	1.16 (0.65, 2.07)	0.82 (0.41, 1.64)
American Indian/Alaskan Native/Native Hawaiian/Pacific Islander	0.59 (0.34, 1.03)	1.05 (0.78, 1.41)	0.92 (0.68, 1.26)	0.91 (0.63, 1.31)	1.13 (0.74, 1.71)
Level of education of parent					

High school/GED or less	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
Some college/technical school	0.68 (0.42, 1.10)	1.22 (0.91, 1.62)	0.85 (0.62, 1.16)	1.36 (1.03, 1.80)*	0.90 (0.64, 1.28)
College or higher	0.42 (0.25, 0.72)***	0.98 (0.74, 1.32)	0.83 (0.61, 1.13)	1.17 (0.86, 1.60)	0.64 (0.43, 0.94)*
Type of insurance					
Private only	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
Public only	0.87 (0.52, 1.46)	0.96 (0.72, 1.27)	0.72 (0.54, 0.97)*	0.91 (0.68, 1.22)	2.11 (1.52, 2.92)***
Multiple	0.80 (0.42, 1.50)	1.02 (0.73, 1.44)	0.60 (0.43, 0.85))***	1.10 (0.79, 1.52)	1.78 (1.19, 2.68)**
Uninsured	0.07 (0.01, 0.45)**	0.38 (0.12, 1.23)	0.50 (0.02, 12.51)	1.80 (0.62, 5.23)	1.42 (0.47, 4.26)
Non-financial Barriers					
Health status of parent					
Excellent	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
Fair/poor	1.42 (0.89, 2.26)	0.83 (0.68, 1.03)	0.97 (0.77, 1.22)	1.35 (1.07, 1.69)**	1.12 (0.82, 1.52)
No parent reported in household	0.80 (0.38, 1.70)	0.64 (0.43, 0.95)*	0.92 (0.59, 1.41)	1.04 (0.69, 1.58)	1.20 (0.78, 1.85)
Level of difficulty in obtaining care from mental health professional					
Not difficult if needed care	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
Somewhat/very difficult	25.63 (12.79, 51.35)***	0.91 (0.70, 1.18)	0.66 (0.50, 0.87))***	1.35 (1.00, 1.84)*	0.86 (0.61, 1.20)
Level of difficulty in obtaining a referral					
Not difficult if needed care	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)

Somewhat/very difficult	0.71 (0.42, 1.22)	0.71 (0.49, 1.04)	0.57 (0.38, 0.87)**	2.25 (1.53, 3.31))***	1.37 (0.88, 2.11)
Financial Barriers					
Out of pocket cost of health care					
Less than $999	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
$1000-$5000	1.27 (0.73, 2.23)	0.67 (0.52, 0.87))***	0.86 (0.65, 1.15)	1.15 (0.88, 1.51)	1.39 (0.91, 2.13)
More than $5000	0.57 (0.24, 1.33)	0.85 (0.52, 1.39)	0.64 (0.33, 1.24)	0.74 (0.36, 1.50)	1.08 (0.58, 2.02)
Insurance benefits meet child's health needs					
Always/usually	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
Sometimes/never	1.47 (0.81, 2.66)	0.97 (0.61, 1.54)	1.32 (0.79, 2.20)	1.17 (0.74, 1.85)	2.17 (1.09, 4.33)*
Uninsured	10.82 (2.09, 56.10)**	2.21 (0.71, 6.87)	0.62 (0.02, 15.69)	0.33 (0.12, 0.92)*	1.36 (0.48, 3.82)
Insurance plan covers needed mental health services					
Always/usually	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)	1.00 (-)
Sometimes/never	1.41 (0.81, 2.47)	1.62 (1.17, 2.26))***	1.24 (0.87, 1.77)	0.86 (0.61, 1.22)	0.61 (0.37, 1.00)*
Uninsured	4.49 (2.26, 8.94))***	2.30 (1.83, 2.90))***	5.90 (4.65, 7.48))***	0.84 (0.67, 1.06)	0.76 (0.56, 1.03)

* p-value <0.05
** p-value <0.01
*** p-value <0.001

APPENDIX-C

Table 16: Difference in Difference model

	Mental Health Provider Visit			Taking Prescription Medicine for Depression/Anxiety		
	(1) AME (95% CI)	**(2) AME (95% CI)**	**(3) DID (95% CI)**	**(1) AME (95% CI)**	**(2) AME (95% CI)**	**(3) DID (95% CI)**
A. Language	**Non-US citizen**	**US citizen**	**Difference between (2) and (1)**	**Non-US citizen**	**US citizen**	**Difference between (2) and (1)**
1. Spanish vs. English	-0.02 (-0.11, 0.06)	-0.01 (-0.06, 0.03)	0.01 (-0.08, 0.11)	-0.12 (-0.22, -0.02)	-0.04 (-0.10, 0.03)	0.08 (-0.04, 0.20)
B. Race	**Non-US citizen**	**US citizen**	**Difference between (2) and (1)**	**Non-US citizen**	**US citizen**	**Difference between (2) and (1)**
1. Non-Hispanic Black vs Non-Hispanic White	-	0.03 (-0.003, 0.06)	-	-	-0.09 (-0.14, -0.05)	-
2. Hispanic vs non-Hispanic White	-0.18 (-0.45, 0.08)	0.02 (-0.01, 0.06)	0.21 (-0.06, 0.48)	0.03 (-0.21, 0.26)	-0.05 (-0.10, -0.01)	-0.08 (-0.32, 0.17)
3. Non-Hispanic Asian vs Non-Hispanic White	-0.21 (-0.49, 0.06)	-0.04 (-0.07, 0.003)	0.18 (-0.10, 0.46)	-0.15 (-0.39, 0.08)	-0.16 (-0.22, -0.11)	-0.01 (-0.25, 0.23)
4. Other vs Non-Hispanic White	-	0.10 (0.01, 0.18)	-	-	0.10 (-0.01, 0.21)	-

Note: AME and DID (example for A. Language)

(i) Adjusted predicted outcome (i.e., adjusted predicted probability of visiting a mental health provider)

(a1) Spanish speakers & non-US citizen

(a2) Spanish speakers & US citizen

(b1) English speakers & non-US citizen
(b2) English speakers & US citizen
(ii) Average marginal effect (AME) = differences in adjusted predicted outcome between comparison and reference.
(iii) For Language, DID = [(b2) - (a2)] - [(b1) - (a1)]
(iv) Estimates were adjusted for probability weight, cluster with strata and primary sampling unit, and robust option.
* p-value <0.05
** p-value <0.01
*** p-value <0.001