The Structure of Mental Health in Haiti: A Latent Class Analysis of Common Mental Disorders, Severe Mental Disorders, Neurological Conditions, Clinical Symptoms, and Functional Impairment

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Submitted in partial fulfillment of the
requirement for the degree of
Doctor of Philosophy
under the Executive Committee
of the Graduate School of Arts and Science

COLUMBIA UNIVERSITY

2021

ABSTRACT

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The experience of mental disorders while part of humanity, reveal inequities that are inhumane due to a lack of quality clinical service provisions globally. In Haiti, a formalized mental healthcare infrastructure developed after the 2010 earthquake where emerging dissemination and implementation studies demonstrated the potential for treatment utilization within recently established primary care. Partners in Health (PIH) and Zanmi Lasante (ZL) the frontline healthcare team have coordinated with the Haitian Ministry of Health to lead this initiative. A community-based mental healthcare system has proven to be sustainable through a task-sharing model, which delivers mental healthcare for common mental disorders (CMDs), severe mental disorders (SMDs), and neurological conditions (NCs)–with specific care pathways for major depression, psychotic disorders, and epilepsy. The extent to which patient mental healthcare are evaluated in lower-middle income countries (LMICs) like Haiti, however, have been limited. The primary aim of this study was to therefore evaluate patterns of mental disorders and to assess current patient care priorities in Haiti. The present study, builds upon previous literature by examining the continuum of mental disorders. A latent class analysis provides a data-driven approach to examine features of mental disorders to inform clinical treatment and best practices. EHR data from PIH

and ZL were obtained from patients (*N*=914) who met criterion for a primary diagnosis and had completed mental health evaluations that were assessed at 13 sites in Haiti from 2016-2018. Known characteristics of mental disorders include the patient's primary diagnosis, mood symptoms such as depression and suicidality, and the level of functional impairment. Accordingly, each were included as an LCA model indicator. Post-hoc multinomial logistic regression (MLR) models predicted mental health class selection and correlates based on the descriptive and clinical symptom variables. Results suggested there are six distinct mental health subgroups, that were distinguished by functional impairment: class 1a "common mental disorders–none to low functional impairment" (11.5%), class 2a "severe mental disorders–none to low functional impairment" (4.9%), class 3a "neurological conditions–none to low functional impairment" (11.1%), class 4b "common mental disorders–high functional impairment" (38.62%), class 5b "severe mental disorders–high functional impairment" (13.02%), and class 6b "neurological conditions–high functional impairment" (20.9%). MLR model 1 revealed CMDs were 2–3 times more likely female and received psychosocial interventions more often, and by comparison SMDs and NCs typically received psychiatric medication. MLR model 2 included patient's clinical symptoms, that suggested severe CMDs with high functional impairment were somewhat more likely depressed when compared to other LCA subgroups. Although, in all likelihood this finding was probably attributed to CMDs including mild to severe forms of major depression, whereas SMDs were mostly psychotic disorder and bipolar disorder. Taken together, the most frequent primary diagnosis included: 1) major depressive disorder (60.3%) and generalized anxiety disorder (27.2%) for CMDs, 2) psychotic spectrum disorders (47.6%) and bipolar disorder (23.7%) for SMDs, and 3) epilepsy (88.8%) for NCs. Patients were infrequently diagnosed with co-occurring

psychological disorders. The varied mental health disorder subgroups that participated in psychotherapy and psychiatric medication management, demonstrate such mental health treatments for Haitian's are feasible and acceptable. While the present analysis was exploratory, LCA provides potential tools for treatment specification and best practices. The WHODAS a measure of functional impairment may be useful as a screening tool for triage, and primary outcome to determine patient improvement. Mental healthcare pathways based on results should expand to include women's mental health and bipolar disorder. These findings are generalizable due to the data being from a community sample and directly from EHRs with inclusion criterion that was not limited by diagnostic specification, symptom severity, or co–occurring disorders. Overall, there is a vast need for mental health services that are broadly accessible for CMDs, SMDs, and NCs. This study highlights, specific clinical training and supervision needs, and the necessity for increased nursing, psychiatry, and neurology collaboration in Haiti. There is hope that healthcare expansion will strengthen and continue to empower communities in Haiti.

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Dedication

To my beloved friends, whom without your endless love, support, compassion, and humor put simply life would not be complete. Annalisa Buehler, Nicole Shields, Morgan Borer, Jocelin Albor, Lauren Gerber, Mel Tillekeratne, Brooke Stoddard, Amanda Grace, Jessie Vukoson, Gabrielle Kniery, Matt Walerstein, Eric Nicolaides, Jan Fielder, Lauren Foley, Dr. Alissa Ellis, and Dr. Leigh Colvin—thank you for everything. To my family and grandmother, your strength and love has encouraged me to be myself.

To our Global Mental Health Lab and Dr. Helen (Lena) Verdeli, for the patience to impart wisdom, care, and compassion that has inspired me as a researcher, clinician, and to embrace the humanity of our world. Dr. Bryan Cheng, thank you for encouraging me, your decisiveness, humor, and knowledge are qualities that very early on were always appreciated.

To our collaborators, at Partners in Health and Zanmi Lasante, in particular Père Eddy and Dr. Giuseppe (Bepi) Raviola whom with mentorship, guidance, and kindness my growth as a doctoral student would not have been possible. Sarah Coleman, Jessie Wilson, Emmanuel Mathieu, Wilder Dubuisson, Dr. Reginald Fils Aimé, Tatiana Thérosmé, Amruta Houde, and the cross-site ZL team—the dedication you give for equity and social justice give reason to the word admiration.

To my lab mates and mentors' past and present, I am deeply grateful for the opportunities to learn and support along the way. I would especially like to thank Dr. Dinelia Rosa and Dr. Barry Farber,

and while my development as a researcher and clinician will continue, I couldn't be more grateful for such knowledgeable, genuine, and devoted professors to provide a foundation. To Dr. Sonali Rajan, I would like to thank you for your academic insights and being on my committee.

To future students, there are moments of doubt and uncertainty but to trust that you are capable to persevere is one of the greatest gifts you can give yourself.

To the citizens of Haiti, may peace and hope find you, and life be given that upholds continued resilience and the courage to overcome.

Chapter 1: Introduction

Purpose of the Study

The overall purpose of the study is to identify characteristics of mental disorders in a lower-middle income country (LMICs), and more specifically to understand the mental healthcare priorities in Haiti. This population has been underserved, and had chronic disparity with regard to environmental, sociocultural, and economic problems that are a continuation of the Independence Debt that was paid to France in exchange for freedom following the slave revolt. The present study, was possible thanks to Zanmi Lasante (ZL) the frontline healthcare team, Partners in Health (PIH), and the Global Mental Health (GMH) Lab at Teachers College, Columbia University. Together, the mentioned teams alongside the Haitian Ministry of Health established a mental healthcare infrastructure after the devastating 2010 earthquake. Capacity building was possible due to a task–sharing model, that includes community providers and specialized care pathways for major depression, psychotic disorders, and epilepsy. The patients were seen at 13 ZL hospital and clinic sites whom more broadly, have common mental disorders (CMDs), severe mental disorders (SMDs), and neurological conditions (NCs). A latent class analysis provides a data-driven approach to examine features of such mental disorders to potentially inform mental health treatment and best practices. Previous LCA studies have been modeled for a specific diagnosis with symptoms examined individually or based on severity, and certain LCA studies have had low methodological quality. Based on prior LCA findings researchers have recommended to move beyond disorder specific subtypes, symptom severity only, and to include functional impairment.

The present study, builds upon previous literature by examining the continuum of mental disorders. The first study aim, was to better understand mental health needs and treatment utilization of an understudied population. The second study aim, was to examine mental health subgroups with a latent class analysis (LCA) based on known characteristics of mental disorders such as the patient's primary diagnosis, mood symptoms such as depression and suicidality, and the level of functional impairment. The third study aim, examined post–hoc multinomial logistic regression (MLR) models to predict mental health classes and correlates based on predictor variables that included descriptive and clinical symptoms. We anticipate the study will contribute to the growing body of global mental health literature in LMICs and allow us to better understand the presence of debilitating problems such as functional impairment, depression symptoms, and suicide that frequently co-occur with mental disorders. Further we hope this research improves our understanding of healthcare practices for CMDs, SMDs, and NCs. Overall, the study aligns with the United Nations Sustainable Development Goals and initiatives led by the World Health Organization.

Global Burden of Disease and Mental Health Treatment Gap

One in five people are estimated to experience a common mental disorder at some point in their lifetime (Steel, et al., 2014), and the prevalence estimate may increase when severe mental disorders and neurological conditions are considered. Such elevated figures contribute to the overall disease burden and years lost of life, and increase the risk of functional impairment globally (Whiteford, et al., 2015). Although 80% of the world's population live in LMICs (Saxena, Thornicroft, Knapp, & Whiteford, 2007), only 10% of mental health resources are allocated to

these regions with the remaining 90% located in high-income countries (WHO, 2005). Taken together, the 90% mental health treatment gap in LMICs should be seen as a global failure (Chisholm et al. 2016; Kohn, Saxena., Levav, & Saraceno, 2004; Patel et al. 2016). Other estimates in LMICs reveal 76.3–85.4% of people received no treatment for their mental health conditions (Demyttenaere, et al., 2004), and these disparities persist even in relatively well–resourced countries such as India and China.

One must highlight, that large treatment gaps further vary by country and mental disorder. For example, according to Kohn and Colleagues (2004) the treatment gap for non-affective psychoses and schizophrenia was reported at 32.2%, whereas in rural Ethiopia surveys collected around the same time-period showed rates that exceeded 90% for people who have never received pharmacological treatment **(**Kebede, et al., 2003). Additionally, global rates of treatable epilepsy are much higher at 80% in LMICs, which suggests that most people do not need to suffer but have significant barriers to treatment access (Meyer, et al., 2010). Both severe mental disorders and neurological conditions require higher levels of care that include medication management and ongoing monitoring for treatable conditions. Many emerging countries only have 1–2 psychiatrists per 100,000 people (Rathod, et al., 2017), therefore, severe mental disorders and neurological conditions have the unjust consequence of lower mental health coverage. In 2008, WHO developed the Mental Health Treatment Gap Action Programme (mhGAP) to address these limits by scaling–up mental healthcare in 90 countries (WHO, 2010). A systematic review of 33 studies that followed the mhGAP guidelines showed an impact on clinical treatment outcomes with minimal training periods that delivered quality results and importantly, the protocols could be culturally adapted.

For example, traditional faith healers were able to diagnose depression with 86% specificity and 46% sensitivity (Keynejad, Dua, Barbui,& Thornicroft, 2017). Therefore, research suggests feasibility with task-sharing models with mental health services delivered by community mental healthcare providers.

A Solution to Scaling-Up Mental Health Treatment: Task–Sharing Models

"Task-sharing", "task-shifting", "collaborative-care", or "stepped-care models" are variable terms in the global health literature that provides a framework to close the mhGAP by including community providers in mental health service delivery. Task-sharing models are based on "care pathways" that consider the identification of clinical groups through screening to determine and prioritize the appropriate level of care (Belkin, et al., 2011). Task-sharing therefore aims to reduce the cost of mental health treatment and increase healthcare access. Task-sharing in mental health engages locals (e.g., teachers, pastoral care) to become community providers and deliver quality services that have been culturally adapted under the supervision of expert professionals (Belkin, et al., 2011; Verdeli, et al., 2016). Through task-sharing, the gains include increased case identification and routine mental health services within primary care settings, which hopefully begins to normalize the process of mental health treatment engagement. Initially, task-sharing models were implemented for depression (Araya 2003 & 2006; Coventry, et al., 2014; Katon, 2012; Raviola, 2020) and have since expanded to other mental health care pathways.

Two systematic reviews and meta-analyses on depression determined task-sharing models outside the United States, have shown mixed clinical outcomes (Gilbody, et al., 2006; Van Straten, et al., 2015), however, there are evident critiques regarding these results. First, while each

systematic review and meta-analysis had considered countries outside the United States the study by Gilbody and colleagues (2006) did not provide categorization by country where the results were reported only as "US" or "non-US." Second, the study did not include the "non-US" countries socioeconomic status, which contributed to the summary of heterogenous results. This suggests, that collapsing variables can result in the interpretation of findings that lack detail. For example, the findings from Van Straten and colleagues (2015) were predominantly from high–income countries such as the United States (*N*=6) and Netherlands (*N*=6) where the results were not favorable to task-sharing models. However, the two LMICs included in the study were Chile (*N*=1) and India (*N*=1). At 6-month follow-up, the study in Chile showed 70% of the intervention group who enrolled in the task-sharing had recovered, when compared to only 30% of the usual care group (Araya, et al., 2006). At 12-month follow-up, the study in India showed the psychiatric symptom scores improved by 3.84 points (Buttorff, et al., 2012). These studies also suggest that task-sharing can be a cost-effective alternative (Araya, et al., 2006; Buttorff, et al., 2012). In a review of 27 randomized control trials, in LMICs for common mental disorders that included psychological care for depression, anxiety, and post-traumatic stress disorder the mental health treatments delivered by community mental healthcare providers had consistent improvement with a medium effect size d = .49, 95% CI [0.36–0.62] (Singla, et al., 2017). The study quality in LMICs could benefit from stronger research methods, however, the results have consistently shown statistically significant clinical improvement in psychological symptoms when services were delivered by community healthcare providers (Clarke, King, & Prost, 2013; Van Ginnekan, et al., 2013).

There are currently limitations as to the interpretability of previous studies on task-sharing models for SMDs and NCs. Predominantly the focus has been on CMDs (Murray & Jordans, 2016), and again there are current limitations for psychiatric medication delivery in LMICs. The task-sharing models taken together certainly deserve further consideration but require improvement in terms of implementation such as financial and governmental support and organizational integration, alongside these factors one must consider the potential for task-sharing models to not overlook more acute and severe patients given the limitations with diagnostic and clinical symptom screening tools. Nevertheless, task-sharing models benefits seem to exceed the current logistical barriers. Task-sharing provides an opportunity to engage the community further into the role of mental health care, which has the strong potential for improved access, reduced social stigma, quality treatment, and reduced healthcare costs.

Limitations with Current Mental Health Screening and Diagnosis

There are several limitations that currently exist with current mental health screening and diagnosis protocols. An example of mental health screening limitations has been observed for depression. Depression while acknowledged as the leading cause of functional impairment accounts for only 3% of the total global disease burden but suicide completion is 78% in LMICs, which suggests there are evident limits to current standardized screening tools. The reasons for the lower depression estimates in LMICs could include unavailable screening measures, social stigma, alternate descriptions for depression symptoms that are not representative of the current diagnostic threshold (e.g., increased somatization), traditional faith healers are sought instead, or protective factors that are unique to the culture (e.g., community rituals) that act as deterrents from seeking

primary care. The cultural variations of psychological phenomena with increased study would improve the screening identification generally in LMICs. The increased demand for mental health screening while apparent, has consistently presented challenges with limited early detection through primary care settings and scarce data from community-based samples (Abas, et al., 2003; WHO, 2008). A lack of screening reduces the likelihood of early intervention, and patients may seek treatment later when the illness is more acute. Notwithstanding, mental health treatment engagement is emerging in LMICs and there are many validated tools available to assess clinical symptoms globally. At present, the most useful screening tools were identified from a systematic literature review by Ali and colleagues (2016) that recommended to use the WHO Self-Reporting Questionnaire 20 (SRQ-20) to screen for CMDs, the General Health Questionnaire 12 (GHQ-12) for CMDs with a physical illness, the Hospital Anxiety and Depression Scale (HADS-D) for depressive disorders, and the Patient Health Questionnaire (PHQ-9) for depressive disorders in literate populations. The Kessler Psychological Distress Scale (K6) provides a screening tool for SMDs (Kessler, et al., 2010). The most comprehensive structured clinical interview would be the World Health Organization World Mental Health Composite International Diagnostic Interview (WHO WMH-CIDI) that is based on ICD-10 diagnoses, however, the administration requires more time, and presents a challenge for high-volume primary care hospitals and clinics.

Limitations to the current screening and diagnostic measures, have been that they do not reflect the local idioms and most measures fully exclude NCs. Screening and diagnostic tools when culturally specific are perhaps more valuable however, and should be adapted from a measure with high sensitivity and specificity, like the ones previously mentioned and validated across multiple

settings (Ali, Ryan, & De Silva, 2016). Further, these adapted measures should follow the WHO translation guidelines that include forward translation, expert panel back-translation, and pre-testing before utilizing the final version for screening use (WHO, 2013). Following validation, the screening tools can be used by non-physician and community mental health care providers, and requires minimal training to administer (Kagee, Tsai, Lund, & Tomlinson, 2012). A locally validated screening measure for depression the Zanmi Lasante Depression Screening Inventory (ZLDSI) that follows such translation recommendations (WHO, 2013) was used for two out of the three care pathways in the present study (Rasmussen, et al., 2015).

Prevalence of Psychological Symptoms After the 2010 Earthquake

Mental healthcare globally is understated but an important consideration given the direct cause of medical illnesses, disability, and premature mortality (Miranda & Patel, 2005). Following the catastrophic 2010 earthquake nearly all Haitians, including children and adolescents, reported some symptoms of post-traumatic stress disorder or major depressive disorder (Cerdá, et al., 2013; Cénat, & Derivois, 2014; Cénat, et al., 2018). The prevalence rates 30-months after the 2010 earthquake were estimated for depression at 36.75% and PTSD 25.98% respectively (Cénat & Derivois, 2014). For children and adolescents' also years after the earthquake, symptoms of severe PTSD were 14.94% and depression 29.6% (Derivois, et al., 2017). In another study where the responses were gathered through interviews of community members in the Nazon area of Port Au Prince the majority of Haitians reported that at least one of their friend(s) or relative(s) was injured/killed (90.5%), had seen dead bodies (93%), had been displaced from their home (37.42%), and lost their job after the earthquake (20.9%) (Cerdá, et al., 2013). Again, nearly all respondents,

endorsed some symptoms of post-traumatic stress disorder (PTSD) or major depressive disorder (MDD) (Cerdá, et al., 2013). Provided these outcomes, trauma exposure is evident for all Haitians including children and adolescents (Cénat, et al., 2018). Understanding the impact on mental health following repeated life events has been important for Haitians undergoing chronic trauma exposure. At the same time, it presents challenges to understand the onset and prognosis of mental disorders given such high levels of chronic stress.

Brief Overview of Haitian Mental Health Delivery

Prior to the 2010 earthquake a formalized mental healthcare system through the newly established primary care did not exist (elaborated in the "before mental health infrastructure" section below). Emerging studies on mental health in Haiti emphasized a vast mental health treatment need but also patient willingness to report their mental health symptoms to providers (Cénat, et al., 2018; Cerdá, et al., 2013; Derivois, et al., 2017). Nevertheless, in the early stages of mental healthcare development, one study showed that three out of four Haitians would prefer to seek community care (e.g., religious leaders, traditional healers) instead of clinical care (Wagenaar, et al., 2012). Through task-sharing Haitians' have been more willing to engage in mental health treatment, which potentially increased due to the services being offered by many local and community providers who had established trust (Fils-Aimé, et al., 2018; Kazdin, et al., 2013; Legha, et al., 2015; Raviola, et al., 2012, 2013, & 2020).

To further develop the mental healthcare infrastructure in Haiti community mental health systems have become the proposed solution and led to the implementation of task-sharing models through mental healthcare pathways (Legha, et al., 2015; Raviola, et al., 2012, 2013 & 2020).

Cognitive behavioral therapy (CBT) and interpersonal psychotherapy (IPT) are evidence-based practices that have revealed beneficial outcomes in global mental health care and are frontline mental health treatment recommendations by WHO. The depression care pathway that was established with PIH and ZL selected IPT as the skills package for deliverables (Raviola, 2020). The adaptation of IPT treatment aims to reflect the local stories, idioms, and cultural practices to provide quality healthcare rather than impose "western" ideals that would not generalize to all settings (Bernal & Rodriguez, 2012). The level of access to mental health services in rural areas continues to be limited, where mobile clinics aim to respond to multiple mental healthcare needs (Fils-Aimé, et al., 2018). In this study, task-sharing models provided the framework to deliver mental healthcare pathways for depression, psychotic disorders, and epilepsy.

The Case for Functional Impairment

Functional impairment reduces years of life (DALYs), time spent away from work or household responsibilities, and contributes to long-standing economic and social disadvantages for the community (McKnight & Kashdan, 2009; Whiteford, et al., 2013). The Social Determinants of Mental Health according to WHO (2014) provides a framework that includes individual factors, social contexts, economic, and environmental factors. Poverty, unemployment, and impoverished social relationships both increase the risk for mental disorders, and lead to worse outcomes for these conditions (Patel et al., 2009). But importantly as has been shown in a recent literature review, some of these adverse socioeconomic outcomes can be reversed with effective mental health care interventions (Lund et al., 2011). Furthermore, all of the psychosocial approaches to address mental disorders in developing countries explicitly acknowledge the role of social

determinants as targets for action, for example, by addressing livelihood skills or interpersonal skills and mobilizing community resources (Balaji et al., 2012; Raja et al., 2012; Verdeli et al., 2004).

For these reasons, there is a strong case to better understand the role of functional impairment in mental health. While further understanding will not eliminate social determinants, an individual's ability to practice self-care and function at school, work, or interpersonally are key elements to subjective well-being and when functioning optimally enhance quality of life. For example, while scarcity of resources is evident in LMICs, improved functioning will allow individuals to assess options and increase motivation. Goals for improved functioning are treatment targets that will provide noticeable outcomes—for example, searching for a job, reaching out to government/NGOs/local organizations to increase food security, moving, or the pursuit of education when possible. CBT provided the treatment targets "thoughts" at times can seem culturally insensitive that one has been told "how to think" when previously implemented into global mental health settings, thus shifting to focus on functional impairment can provide a new framework that normalizes the mental health treatment process. LCA models to date, have not typically included functional impairment as an indicator.

A Lack of Evaluation of Mental Health Service Delivery in LMICs

In general, provided that many community mental health systems were recently established in LMICs most have not been rigorously evaluated. Studies are usually completed at a single time-point, often do not include partnerships with local governments to provide sustained care, and are not standardized in their measurement procedures. The focus understandably in Haiti like many

other LMICs has been more on building the initial mental healthcare infrastructure. Following assessment of feasibility, access, and acceptance of services it is important to assess best practices generally. Of importance will be to prioritize sustainability, continuity of services, the delivery of culturally adapted care, efficacy and the quality of services, safety and ethics for healthcare teams and patients, and to consider patient and collaborative care improvement.

The measurement of such outcomes across sites can be challenging in LMICs, where paper and pen are possible for assessment but may present challenges for large data entry at-scale. A lack of electricity, internet, computers, or well-resourced infrastructures are common, and further there are issues with migration, political instability, and unstable infrastructure. High-income countries essentials are not necessarily available, and competing clinical tasks that take priority or resistance to the language of the measure itself are current challenges to completion of such standardized assessments. For example, computer-based EHRs in Haiti initially had limitations due to the scarcity of internet access that has since been resolved and engagement with completing standardized measures gradually increasing (Raviola, et al., 2020). The establishment of EHRs provide an opportunity to understand key insights about the current and ongoing mental healthcare structure by offering an efficient way to analyze data. Date-driven approaches that utilize big data from EHR provide important analytics on mental health needs and treatment quality that can be assessed at varied time points (vs. a single time-point). The challenges with current methodological evaluations of GMH research include the emphasis on treatment-studies that may have low methodological quality. A data-driven approach from the start will hopefully provide insight into

the structure of mental healthcare practices that afterward will inform treatment studies in a more country specific way rather than results that are generalized to LMICs.

Chapter 2: The Sociocultural Context and Community Mental Health in Haiti

Recurrence of Natural Disasters & Displacement

Environmental factors impacting Haiti are repetitive and devastating with regard to natural disasters. The most notable environmental events have included Hurricane Ivan and Jeanne, 2004; Fey, Gustav, Hanna, and Ike, 2008; earthquake, 2010; Hurricane Sandy, 2012; and Hurricane Matthew, 2016. The death toll from the 2010 earthquake alone, was 220,000-300,000 the number of people living in many cities ("CNN: Haiti Earthquake Fast Facts," 2017). Hurricane Matthew destroyed 90% of Haiti South, and many of the already limited resources. Since Hurricane Matthew 140,000 people have been displaced from their homes, and even years later reside in displacement camps (HRW "Haiti Events of 2019," 2019). The natural disasters have largely impacted transportation, electricity, commerce, and school infrastructures.

Due to these inescapable social conditions, many Haitians try to migrate to the Dominican Republic, Venezuela, and United States ("United Nations High Commissioner for Refugees: Migration Profiles," 2013). More recently, in the United States and Dominican Republic mass deportation has been common ("Dominican Republic: Amnesty International Calls the Dominican Republic to Stop Forcible Deportation of Haitians," 2012; Kaiser, Keys, Foster, Kohrt, 2015; "Human Rights Watch: World Report 2018: Rights Trends in Haiti," 2017; "U.S. Cancels Program for Recent Haitian Immigrants; They Must Leave By 2019," 2017). For Haitian's, there are multiple reports of social injustice, intolerance, and a lack of social integration when Haitian's

migrate and assimilate into another culture. In summary, repeated tropical storms and natural disasters have exacerbated economic and social instability in Haiti.

Current Social Problems

Haiti is the poorest country in the Western Hemisphere, with 59% of people living below the national poverty line ("Partners in Health Haiti", 2019; "The World Bank in Haiti: Overview", 2019). The majority of Haitian's live off $1-2 per day, where survival sex or trading sex for food is not uncommon ("United Nations High Commissioner for Refugees: Driven by Desperation," 2011; Verner, et al., 2008). Basic sanitation, electricity, food insecurity, and minimal access to water are frequent concerns in rural and urban areas ("The World Bank: Living Conditions in Haiti's Capital Improve, but Rural Communities Remain Very Poor," 2014). Of the urban poor 63% have electricity access, and 48% have improved sanitation access. The rural poor have 11% electricity access, and 16% have improved sanitation access. Throughout the country, food insecurity and a lack of water access are directly related to issues of sanitation and hygiene reducing the potential for survival.

The resources to mobilize oneself out of these devastating social conditions are few, especially with limited access to education, which is a main indicator of future economic stability. It is estimated illiteracy is incredibly high (rural areas 80%; urban areas 47%) and due to the series of hurricanes and the major 2010 earthquake significant damage has resulted in fewer schools that destroyed the already limited educational resources ("WHO Culture and Mental Health in Haiti: A Literature Review," 2010). The work and unemployment rates given these circumstances are expectantly high with 49% unemployment in metropolitan areas, 37% in semi-urban areas, and

36% in rural areas ("WHO Culture and Mental Health in Haiti: A Literature Review," 2010). More recently, political unrest has turned violent after the rise of fuel prices by 50% that have led to power outages, road blocks, and over the past year further economic instability has resulted in local kidnappings-for-ransom ("Chicago Tribune: Haiti violence over fuel prices strands a number of U.S. volunteer groups," 2018; "CNN: As Haiti protests continue, US citizens warned to shelter in place," 2018; NYT "Haiti Braces for Unrest as a Defiant President Refuses to Step Down" 2021). Persistent economic problems greatly burden the citizens of Haiti and likely are indicators of poor mental health. Mental health while important only addresses these problems at an individual level, therefore the major systemic issues must be resolved that contribute to cycles of poverty—such as the lack of access to jobs, education, housing, political corruption, and food insecurity.

Colonialism in Haiti

Haitians had a vision to take the words of oppressors and turn them into words of freedom. Haiti has a rich history of galvanizing their own revolution that was inspired by French Enlightenment thinkers (Bristow, 2017). The French Revolution lasted ten years from 1789 to 1799. The Haitians, were informed by France's desire to be at war for the benefit of independence, and therefore Haitian's went into their own battle to end colonization and slavery from 1791 to 1804. Noteworthy, were the successes found amongst the disenfranchised and otherwise separate social groups of bourgeoisies, peasants, and slaves. Perhaps the irony of these mutually timed wars, is a great example of the French Revolution leaders not putting one's own belief system into practice. Similarly, the American Revolution from 1775-1783 was propelled forward by ideas of

freedom from the *"philosophes"* even after their victory the United States continued to uphold slavery until the end of the Civil War in 1865 (Wallace "American Revolution United States History," 2018). The heroism of Jean-Francois Papillion, Georges Biassou, and Toussaint Louverture demonstrated Haiti's willingness to be unified against racial oppression and slavery that was culturally embedded, and inspired the resilience and beauty of Haitian culture (Nicholson, 2006).

Issues related to colonialism have continued, with one example being the Independence Debt that was paid in exchange for freedom to France until 1947 because slave owners wanted reparations. The amount repaid is equivalent to 17BN euros today (BBC "France urged to repay Haiti's huge independence debt", 2010), with the current Haitian GDP equivalent to 12.8BN euros today. There is a discrepancy with such an unjust resolution established with France, and irrefutable consequence that has led to further destitution for Haitians. A painful history, that continues in many ways and written by the trauma of colonization makes current shifts to collaborate doubtful at times. The interwoven factors of current social determinants while failing to be continuously recognized on a global scale, reveal that equity and health have provided difficult conditions to uphold. Perhaps such disappointments might be considered a global responsibility to consider the contribution to such extreme disparities in Haiti, and yet instills a broader calling to not forget the repeated devastation that has impacted this small but resilient country.

Further Social Injustice

A recently proposed law equated LGBTQ orientation to the level of consideration of a child sex offender with unreasonable fines and prison sentences ("Human Rights Watch: World Report 2018: Rights Trends in Haiti," 2017). Prenatal care, early child development, and family planning collectively are limited ("WHO Culture and Mental Health in Haiti: A Literature Review," 2010; "United Nations High Commissioner for Refugees: Migration Profiles," 2013). Interpersonal violence, specifically toward Haitian women, are often considered normative relative to human rights standards (Rahill, et al., 2020; Verdeli, et al., 2016). For example, domestic violence, stalking, and sexual harassment is legal, while rape is the only illegal crime but rarely reported due to high social stigma ("Human Rights Watch: World Report 2018: Rights Trends in Haiti," 2017). Along these lines, Restavek is a widely-accepted form of child slavery where children are highly vulnerable to physical and sexual violence, however, the families have little means or resources to support their children where servitude to a wealthy family seems like a safer option ("WHO Culture and Mental Health in Haiti: A Literature Review," 2010). Lastly, while HIV related social stigma has improved it has remained another evident challenge to overcome (Castro & Farmer, 2005; Farmer, 2001).

Establishment of Primary Care in Haiti

Routine medical care while available is not always routine. The majority of Haitians (90.6%) do have access to primary care within 3 miles of their home and only a limited number (23%) live near service delivery sites that have been rigorously evaluated as "good quality" (Gage, et al., 2016). Despite the access reported there is only one doctor or nurse per 3,000 persons and

the public sector healthcare spending is amongst the lowest in the world (Gage, et al., 2016). It is incredible the amount of care that Haitians have for each other, otherwise the healthcare system would not survive without the dedication of citizens. Community level providers have been the cornerstone of medical and mental health for many years (Walton, et al., 2004). Common medical concerns in Haiti include HIV (2.1% prevalence) in particular mother to child transmission, cholera, tuberculosis (188 per 100,000), and lymphatic filariasis (American Medical Association, 2015; "Haiti's Health System — CDC," 2013; Oscar, et al., 2014; "Partners in Health Haiti", 2019). With regard to family planning the resources are limited throughout the country and contribute to high rates of maternal and child mortality under the age of 5-years-old (67 per 1,000) (Gage, et al., 2016; "Haiti's Health System — CDC," 2013; "Partners in Health Haiti", 2019). Routine infant vaccinations are not fully adopted by families, which limit the overall ability to control the spread of disease (American Medical Association, 2015; "Haiti's Health System — CDC," 2013). Despite current outcomes, there have been extensive efforts to rebuild the healthcare system following the 2010 earthquake that have not gone unnoticed. Healthcare improvements for Haitians have included access to HIV treatment, TB treatment, and an integrated healthcare infrastructure coordinated with the Haitian Ministry of Health ("Partners in Health Haiti", 2019).

Before Haitian Mental Health Infrastructure: The Role of Religion & Spirituality

Before the 2010 earthquake, mental health was not part of the primary care infrastructure and traditional healers or religious leaders were sought instead (Grelotti, et al., 2015; Tiberi, 2016). In 2011, there were two psychiatric hospitals that included Défilé de Beudet Hospital with 120-beds, and the Mars and Kline University Hospital with 60-beds, but neither had human rights

oversight (Raviola, 2020). Early mental healthcare was focused on HIV related support and severe mental illness. Beyond this, some NGOs and religious organizations delivered mental healthcare. Spirituality and religion have always been imbued in Haitian medicine, and mental health. Roman Catholicism, Voodoo Priests, and more recently Protestantism are upheld religions in Haitian culture (Auguste & Rasmussen, 2019; Blanc, et al., 2016), although for some Haitian's there is a rejection of Christian beliefs and preference for Voodoo because it opposes French colonialism. Likewise, African-centered spirituality can at times be misunderstood by the west, and yet often is still practiced alongside Christian denominations such as Catholicism and Protestantism (Auguste & Rasmussen, 2019). The Voodoo spiritism of Haiti is widely accepted where concepts of self-include "pitit bon anj" (little good angel), the "gwo bon anj" (big good angel), and the "kò kadav" (body cadaver) that are meant to harmonize together ("WHO Culture and Mental Health in Haiti: A Literature Review," 2010). Mental health is often based on such Cosmo centric values that spirit when aligned with the natural order of the universe will provide good health. In many ways, these beliefs parallel other religions and notions of spirituality (e.g., Holy Trinity, Karma, or Archangel Gabriel/Gavriʾel/Jibrail).

It is widely accepted in Haiti that the root cause of mental health problems can also be due to a hex or curse rather than be biological in nature (Sterlin, 2006; Tiberi, 2016), especially with regard to epilepsy (Cavanna, Cavanna, & Cavanna, 2010; Obeid, et al., 2012). This has led to human rights abuses where people with psychosocial disabilities will be chained or "shackled," and family support becomes the only available or understood mental healthcare for the affected individual especially in rural areas (Rathod, et al., 2017; Raviola, et al., 2020). One study showed

that three out of four Haitians would prefer to seek community care instead of clinical care for mental distress, despite average treatment costs at $1 for hospitals, $6 herbal healers, and $120 Voodoo Priests (Wagenaar, et al., 2012). Spiritual views of mental health persist, and lead to difficulty for Haitian's to report suicidal thoughts to mental healthcare providers, despite frequent reports of completed suicides there has been continued preference to report such symptoms to religious leaders and traditional faith healers (Auguste & Rasmussen, 2019), which suggests there needs to be increased psychoeducation for community members and collaboration. The role of spirituality and religion in Haiti are therefore important considerations for mental health treatment collaboration, patient engagement, and suicide prevention.

Chapter 3: Literature Review of LCA, Indicators, and Predictor Variables

LCA and Mental Disorders

Latent class analysis provides a novel data-driven approach to examine mental disorders where subgroups inform clinical treatment targets. In previous latent class analyses, the majority of studies have been on upper-middle or high-income samples from the United States, UK, Switzerland, Australia, France, Brazil, and China (Kendler, et al., 1998; Li, et al., 2014; Pignon, et al., 2017; Ulbricht, et al., 2018; Weich, et al., 2011). A study that used a latent transition analysis to examine cross-country depression prevalence included only one LMIC in Nigeria, which showed exceptionally low rates of depression prevalence when compared to three higher income countries (The United States, New Zealand, and South Africa) (Scorza, Masyn, Salomon, & Betancourt, 2018). Potential reasons for the lower depression rates reported in this study may have been attributed to differing illness presentations when compared to other cultures, or perhaps Nigerians are more resilient. Further, the age of onset was older for Nigerian adults, and perhaps there was simply a lack of endorsement to the initial screening questions that are necessary for further diagnostic evaluation on the WHO WMH-CIDI (Gureje, Lasebikan, Kola, & Makanjuola, 2006; Scorza, et al., 2018).

LCA studies have mostly focused on a single diagnosis. LCA research literature in mental health predominantly pertains to major depression and results have been inconsistent, which is likely due to the varied indicators included in the model (Li, et al., 2014; Ulbricht, et al., 2018). A few LCA studies exist on psychosis specifically (Kendler, et al., 1998; Pignon, et al., 2017),

however, the results are consistent and support a psychotic continuum. LCA studies on epilepsy are nascent and include associations with an autism comorbidity (Cuccaro, et al., 2012). LCA studies that include more than a single diagnosis have supported a 2-factor model for internalizing/externalizing disorders that emphasize research more on psychopathological processes as opposed to diagnostic specificity (Krueger, et al., 1998). Building upon this research another study examined how bipolar disorder and psychotic disorders fit into this structure of internalizing/externalizing disorders and relate to each other (Vaidyanathana, Patrick, & Lacono, 2012). The results while preliminary suggest again internalizing/externalizing disorders are distinct subgroups, and separately there may be more of a continuum with bipolar disorder and psychotic disorders (Vaidyanathana, Patrick, & Lacono, 2012). The dimensional approach has been adopted by global mental health research for quite a while, which emphasizes the categorization of CMDs, SMDs, and NCs. Internalizing/externalizing disorders would fit into the CMDs categorization. Substance and alcohol use disorders in global mental health literature have been considered separately, and in the mentioned LCA studies would be considered an externalizing disorder. For the present study, substance and alcohol use disorders were not a presenting problem.

Other LCA studies predominantly focus on clinical symptoms only and categorize LCA subgroups based on severity (Ulbricht, et al., 2018), without consideration to frequently co-occurring problems such as suicidality, psychiatric co-morbidity, and functional impairment. A few LCA studies on depression have included suicidality and found that suicide, guilt, and hopelessness are depression symptoms that frequently co-occur. LCA subgroups that were

"moderate" to "severe" had high probabilities of suicidality (moderate=87%; severe=94%), guilt (moderate=66%; severe=88%), and hopelessness (moderate=87%; severe=99%) (Yi, et al., 2014). Another LCA study on women with post-partum depression from seven countries that were all high-income samples (N=17,912), showed for the "severe" latent class subgroup the total suicidal ideation was high at 83% with the endorsement of "sometimes" (16%) and "yes, quite often" (67%). Interestingly, the "moderate" subgroup rarely had endorsed suicidal ideation as "sometimes" (6%) or denied the statement "yes, quite often" (0%). A study from Brazil had a 4-class solution and showed high rates of psychiatric comorbidity in the presence of high suicidality [(class 3: suicidality=15.8%; psychiatric comorbidity=68.2%) (class 4: suicidality=29.4%; psychiatric comorbidity=68.4%)] (Cotrena, et al., 2016). Another study revealed comorbidity of psychiatric disorders in the UK was as high as 31% (Weich, et al., 2011). This provides a brief review of LCA research more generally on mental disorders and the associated features like suicidality, psychiatric comorbidity, and again, LCA research has been limited on functional impairment. Other LCA limitations have included low methodological quality. For example, a study that examined co-occurring psychiatric disorders in Brazil, which is important to better understand but the sample size was not large enough for an interpretable LCA (Villalobos-Gallegos, et al., 2017). A similar issue presented in a study on epilepsy (Spector, Cull, & Goldstein, 2001). To our knowledge, this is the first LCA study examining the structure of mental health specific to an LMIC and that as recommended based on previous literature examines the continuum of mental disorders, suicidality, psychiatric comorbidity, and functional impairment.

LCA Model Indicators

Common Mental Disorders

Steel and colleagues (2014) completed a systematic-literature review and meta-analysis, which reported in 26 high-income countries and 37 LMICs, showed on average, one in five adults or 29.2% of the population are affected psychiatrically in their lifetime. The mental health treatment gap for CMDs has revealed inadequate mental healthcare coverage for those living in high-come countries 72%, upper-middle income 79%, lower middle-income 86%, and low-income 93% (Chisholm, et al., 2007). The definition of CMDs according to the NICE Guidelines include generalized anxiety disorder, panic disorder, phobias, social anxiety disorder, obsessive-compulsive disorder, and post-traumatic stress disorder (National Collaborating Centre for Mental Health UK, 2011). PTSD has been difficult to assess in a global context due to chronic stress and sociocultural determinants. Somatization often presents as a symptom in anxiety related disorders or major depression and therefore, are frequently a feature of CMDs. The comorbidity of depression and anxiety related disorders may lead to worse clinical outcomes (National Collaborating Centre for Mental Health UK, 2011), and high-income samples have shown this is likely an indicator of treatment resistant depression (Fava & Davidson, 1996). Issues of diagnostic specificity are less tenable globally due to screening and diagnostic measures that are not culturally adapted, and such specificity may not initially be necessary to determine care pathways. Therefore, CMD categorization are contextually appropriate globally.

Severe Mental Disorders

Depression has often been categorized as a CMD except when present with psychotic features or hypomanic/manic episodes. This would instead indicate bipolar disorder, psychotic related disorders, schizophrenia spectrum disorders, or major depressive disorder with psychotic features, which would instead be categorized as an SMD. For severe mental illnesses, such as schizophrenia spectrum disorders, psychotic related disorders, or major depression with psychotic features around 23 million people are affected worldwide, whereas bipolar disorder is diagnostically more common affecting around 60 million people globally (WHO "Fact Sheet Mental Disorders," 2018). The research on SMDs globally while minimal deserves further consideration given the increased likelihood of human rights abuses. It is not rare for people with SMDs to be tied to poles, shackled, institutionalized for extended periods of 10 years or more, or left with limited to no social contact (Patel & Prince, 2010; Raviola, et al., 2020). The research to date has mostly focused on schizophrenia with limited knowledge on the identification and treatment of SMDs generally. The SMD population tends to have shortened lifespans potentially due to comorbid physical conditions (WHO, 2017).

Neurological Conditions

Importantly, CMDs and SMDs as mentioned account for the highest proportion of DALYs (56.7%) which is then followed by NCs (28.6%) (Whiteford, et al., 2015). Likewise, neurological conditions, epilepsy, and dementia are not uncommon in the presence of depression but are poorly understood in global contexts (Kanner, 2006; Lipton et al., 2000; Rickards, 2006). It should be noted other NCs such as Parkinson's Disease, Huntington's Disease, Multiple Sclerosis, and stroke

extend beyond the focus of this brief research summary and were not presenting problems in the present study. First, dementia affects 47 million people and 63% of those affected live in LMICs. Dementia has been linked to a loss of independence where 50% of individuals become reliant on a caregiver with aggressive behavior, hallucinations, repetitive actions, and wandering in the later stages of the illness (Thakur, et al., 2016). Second, epilepsy prevalence and severity has been shown to be much higher (80%) in LMICs including Haiti (Collaborators, G. B. D. E., 2019; "Fact Sheet Epilepsy," 2019). Epilepsy and convulsions have a range of causes that include road traffic accidents, infectious diseases (e.g., malaria), tumors, stroke, autoimmune diseases, genetics, and birth related injuries (Thakur, et al., 2016).

These issues are exacerbated in LMICs especially with a lack of quality hospitals, neurologists, psychiatrists, nurses or simply the necessary medications nearby. It is estimated that up to 70% of individuals with epilepsy could live seizure-free with proper screening and medication treatment ("Fact Sheet Epilepsy," 2019). The severity of this problem extends past barriers such as treatment access. Other issues of sanitation, limited water access, and food insecurity likely influence the onset or illness course of NCs globally. For example, in Western Uganda, South Sudan, and Tanzania an illness called Nodding Syndrome (NS), a rare form of epilepsy, though the cause is not clearly defined likely is due to an inappropriate immune response to parasitic worms (Friedrich, 2017). Individuals with epilepsy are another group at high-risk for further mistreatment that include limiting ones right to drive, work, or shackled (Collaborators, G. B. D. E., 2019; "Fact Sheet Epilepsy," 2019). The experience of seizures in Haiti has often been heavily stigmatized and are believed to be a voodoo hex or curse that limits the patient's treatment

access to psychiatric medication as it does not fit the cultural explanation of the illness (Cavanna, Cavanna, & Cavanna, 2010; Obeid, et al., 2012).

Depression Symptoms

The Zanmi Lasante Depression Screening Inventory (ZLDSI) provides a screening tool for depression and has been validated for use with school-age youth in Haiti (Legha, et al., 2020). The measure has been broadly used in Haiti by PIH and ZL (Fils-Aimé, et al., 2018; Legha, et al., 2020) and further for research on Haitian experiences as immigrants in the United States (Fanfan, et al., 2020). ZLDSI items were mostly adapted from the PHQ-9 and followed the recommended WHO translation guidelines from English to Haitian Creole. For example, on item–7 for the PHQ-9 "trouble concentrating on things, reading the newspaper or watching television" was changed to "listening to the radio or attending a ceremony" because of limited literacy and poverty (Rasmussen, et al., 2015). The other ZLDSI items use local idioms to reflect culturally adapted expressions of depression. The local idioms were developed by key informants that consisted of six Voodoo priests/priestesses (five men, or houngan, one woman, or manbo), one herbalist (doktè fey, a man), one sacristan (a man), one primary care doctor (a man), two teachers (both men), and two respected community members (both women) (Rasmussen, et al., 2015). Hougan and manbo are "male and female specialists in serving the spirits" (Brodwin, 1996). The key informants shared with researchers the problems people in the community frequently seek healing for and items were selected that reflected descriptions of depression. The final 13-item measure has provided a depression screening tool that has been well-received by healthcare providers and patients (Raviola, et al., 2020). However, patients expressing suicidal ideation may not be fully captured

by the measure despite screening access. Many locals continue prefer to share suicidal ideation with religious leaders, traditional healers, or herbalists *Doktè fey (*Auguste & Rasmussen, 2019*,* which suggests the need for further integration of these local providers into the mental healthcare infrastructure.

Functional Impairment

Mental and substance use disorders are the leading cause of non-fatal disease burdens globally (Whiteford, et al., 2010). The World Health Organization further reports that depression is the leading cause of functional impairment globally (Greer, Kurian, & Trivedi, 2010; Edlund, et al., 2018; WHO, 2017). The illness course of major depression tends to be chronic and recurrent contributing to the high global disease burden (Miret, Ayuso-Mateos, Sanchez-Moreno, & Vieta, 2013). The tremendously high burden of mental disorders is exhausted to a greater extant by the direct and indirect treatment costs (Miret, et al., 2013), which are further exacerbated by functional impairment. CMDs, SMDs, and NCs limits one's ability to make household contributions and therefore drive social inequities that have the potential to become permanent without mental health treatment (Emerson, et al., 2011). Treatment studies to date often emphasize psychological symptom relief rather than improvement in role functioning, which can be problematic for many reasons (McKnight & Kashdan, 2009). Nevertheless, recent studies particularly in the global mental health literature now consider role functioning a key measure of treatment efficacy (Habtamu, et al., 2018; Hamdani, et al., 2017; Jordans, et al., 2019; Murphy, et al., 2017). The scales commonly used to measure functional impairment globally include the Sheehan Disability

Scale (SDS), Disability Adjusted Life Years (DALYS), and World Health Organization Disability Assessment Schedule (WHODAS).

Suicidality

As described a diagnosis of major depression presents with the endorsement of suicidality in about 50% of cases (Ferrari, et al., 2014). To highlight, the absolute necessity for mental health treatment access in developing countries, 78% of completed suicides occurred in LMICs (Bachmann, 2018), where the most common method was self-poisoning with pesticides (WHO, 2018). Known risk factors in global health for suicide include living in a rural area, 15-29 years of age, impulsivity, female gender, traumatic life events, marginalized groups (e.g., LGBTQ, prisoners), and history of a previous suicide attempt (WHO, "Fact Sheet Suicide," 2018). In LMICs a systematic literature review by Lemmi and colleagues (2016) further assessed suicidal ideation and completion with the relationship between poverty, unemployment, and at the country level economic crisis and instability. The results, consistently showed that individual level poverty and unemployment increased the risk for suicidal ideation and behavior. It was unclear, whether economic instability for a country impacted these results, which were possibly due to confounding variables, and while challenging to disentangle such complexities that are likely interrelated factors.

Psychiatric hospitalization in high-income samples increase the likelihood of future suicide attempts, particularly in the first 3-months following hospital discharge (Chung, et al., 2017). In a global context, psychiatric inpatient units are not usually accessible, or may have minimal human rights oversight and provide an opportunity for LMICs through community-based mental health

within primary care to reduce suicide risk. Nock and colleagues (2010), have shown that when controlling for psychiatric comorbidity major depression was the strongest predictor of suicide. However, a secondary diagnosis of anxiety showed impulse control disorders (e.g., oppositional defiant disorder, conduct disorder, attention deficit hyperactivity disorder, and intermittent explosive disorder) and substance use disorders significantly increased the likelihood of a suicide plan or attempt. Environmental risk factors (e.g., war, economic instability, lack of sanitation) may impact a sense of hopelessness and potentially increase the likelihood of suicidality. Taken together, screening for suicidal ideation and safety planning should become standard practice for CMDs, SMDs, and NCs to be effective at reducing suicide risk globally.

Predictor Variables: Demographic Characteristics and Clinical Symptoms

Gender and Mental Disorders

CMDs disproportionately affect women, and for depression the risk of developing the disorder has been continuously found to be 1.5 to 2.5 times higher for women when compared to men (Kessler, 2003; National Collaborating Centre for Mental Health, 2011). In Haiti, the results to date show that women who are unmarried and educated are more likely to be depressed, however, male depression was slightly higher when there was a history of childhood maltreatment (Martsolf, 2004; Wagenaar, et al., 2012). Women living in rural parts of Haiti had higher scores on a culturally adapted version of the Beck Depression Inventory (BDI) (Wagenaar, et al., 2012). These symptoms worsened if they had lost a family member in the earthquake or believed spirits had caused their depression. Globally, the reasons for increased risk of CMDs amongst women include interpersonal and sexual violence, more childcare responsibilities and giving birth,

potential history of childhood maltreatment, and greater likelihood of poverty (Weich, et al., 2011; Patel, et al., 2007). Taken together, these factors impact the prognosis of mental disorders especially depression, and likely worsen in the context of chronic stress environments. For SMDs and NCs gender differences are not notable. With consideration to severe mental illness, gender rates typically are consistent for men and women however, this part of the global literature often considers diagnoses of bipolar disorder and schizophrenia only, which affects less than 2% of the population worldwide (World Health Organization, 2013). Other SMDs to consider include major depression with psychotic features and psychotic spectrum disorders. The research globally on the gender differences for neurological conditions is growing, and epilepsy has shown mixed evidence that unprovoked seizures could be higher in men (WHO, "Fact Sheet Epilepsy," 2019).

Age and Mental Disorders

There is very limited information on basic demographics and the relationship to mental health outcomes, especially in rural parts of Haiti (Wagenaar, et al., 2012). Other LMIC studies have indicated that younger age (18-25) (WHO, 2014) or in India older age (Patel, et al., 2012) may increase the likelihood of depression, however, generally the frequency of mood episodes decreases with age (Kessler & Bromet, 2013; Patten, et al., 2006; Weissman, et al., 1996). A large-scale study from Marwaha and colleagues (2007) in the UK looked at the Adult Psychiatric Morbidity Survey (APMS) and found that mood instability was the highest for ages 16-24 (26%), and gradually decreased thereafter (ages 25-34, 19.5%; 35-44, 15.4%; and 45-54, 14.7%). The lowest rate of mood instability was for individuals 75 or older (3.6%). There may be a difference in mood symptoms depending on location, where risk decreases for older adults from high-income

countries vs. LMICs where it appears to increase. Reasons for this might include further financial destitution with older age in LMICs, or seeking mental health treatment for the first time later in life. Overall, mental disorders affect individuals across the lifespan globally.

Psychotherapy Received

Over the past 15 years interpersonal psychotherapy (IPT) has expanded globally to India, Chile, Uganda, Lebanon, United States, Kenya, Colombia, Israel, Nepal, Kenya, and continues to grow (Rose-Clarke, et al., 2020; Verdeli, 2016). Research studies have shown the benefit of IPT for the clinical treatment of depression and other mental disorders in LMICs and economically developed countries (Markowitz, et al., 2015; Verdeli, 2016). IPT offers a flexible treatment that has been applicable to a range of countries, participants, and settings (Opiyo, et al., 2016; Verdeli, 2016). When relevant IPT further integrates the role of family, traditional healers, community leaders, and spiritual beliefs into the sessions (Verdeli, 2016). IPT has been delivered individually and in group settings to focus on the main triggers of depression such as role transitions, grief and loss, interpersonal disputes, or the development of interpersonal social skills (Lewandowski, et al., 2016; Verdeli, 2016). Provided the many research studies that have shown evidence-based support for IPT treatment, the present study wanted to understand the level of treatment engagement when adapted to provide mental healthcare for a Haitian population (Raviola, et al., 2020; Verdeli, 2016).

Psychiatric Medication

The WHO Mental Health Gap Action Programme (mhGAP) aims to close the mental health treatment gap globally. As mentioned previously one of the largest problems for delivering services for SMDs and NCs has been low coverage of medical doctors (generalists), psychiatrists,

neurologists, and nurses. In many emerging countries there are only 1-2 psychiatrists per 100,000 people, which limits mental health treatment access even when there are primary care facilities nearby (Rathod, et al., 2017). Further, while feasible to scale-up mental health treatment the lack of availability in some areas and cost of psychiatric medications has been a major treatment barrier, especially when many individuals live off only $1-2 per day (Chisholm, et al., 2016). As mentioned the task-sharing models provide a solution to expand training and to properly allocate resources based on illness severity. Further, when services are delivered in coordination with the government or NGOs this provides an opportunity to provide free mental healthcare, which has the added benefit of increased work productivity for the country. Research on the use of psychiatric medication in global mental health literature is limited, and including such research with a Haitian population will allow us to better understand the needs and necessary resources to target mental disorders.

Number of Visits During Observation Period

Research on task-sharing models have shown improved clinical outcomes consistently with an average of 10 training days prior to treatment delivery (Singla, et al., 2017). In addition, the number of psychotherapy sessions typically went up to 10 appointments to have observed clinical improvement and were held for 1-hour each over the course of 2-3 months (Singla, et al., 2017). IPT was the primary treatment delivered in this study and patients received the time-limited treatment for 12-16 weeks with 1-hour sessions (Markowitz & Weissman, 2004). An IPT brief (IPT-B) model has shown improved clinical outcomes after 8-sessions (Swartz, Grote, & Graham, 2014) and evidence suggests, that effective aftercare for IPT treatment may include monthly

maintenance sessions (Frank, et al., 1990). Global settings may present other challenges for mental health treatment engagement such as the cost to travel to the appointment, competing needs such as attending or seeking work, simply seeking food and water, social stigma, and the cost of ongoing care.

Chapter 4: Present Study Aims and Hypotheses

Overarching Aim.

To explore the characteristics of mental health patterns in Haiti, that to date are unknown. The majority of research thus far has focused on the development of a community mental healthcare infrastructure and validation of screening measures. Further, existing treatment studies are often for a specific diagnosis and since mental healthcare services in primary care are new the research has been nascent.

Aim 1. To describe critical demographic factors (gender, age), clinical characteristics (depression symptoms, functional impairment, suicidality), and the primary and secondary ICD-10 diagnoses of mental health in Haiti. Treatment utilization was examined based on the primary diagnosis and patients were categorized as CMDs, SMDs, and NCs to look at the number of patients and percentage of service use for psychotherapy, psychiatric medication type/dose/frequency, delivered treatment location, provider type, and the number of visits during the observation period of an understudied population.

Hypothesis 1a. Descriptive statistics will provide key data about the mental health treatment needs of clinical subgroups in Haiti.

Hypothesis 1b. Preliminary Pearson's correlation and chi-square tests will show statistically significant group differences for descriptive and clinical symptoms when compared to common mental disorders, severe mental disorders, and neurological conditions.

Aim 2. To use an LCA to examine mental health classes based on 6 indicators: Common Mental Disorders, Severe Mental Disorders, Neurological Conditions, Level of Functional Impairment, Depression Symptom Severity, and Suicidality.

> ***Hypothesis 2.*** Based on previous research results have recommended to include functional impairment, more than a single diagnosis that expands upon the 2-factor model with CMDs, SMDs, NCs, and to move beyond symptom severity only. To our knowledge, this is the first LCA study specific to the structure of mental health in a LMIC and global mental health setting. For these reasons, the LCA analysis was considered exploratory.

Aim 3. To use post-hoc multinomial logistic regression models to predict mental health class selection and correlates based on MLR model 1 demographic variables: Gender, Age, Psychotherapy Received, Psychiatric Medication Received, and Number of Visits During Observed Period. To also use post-hoc multinomial logistic regression models to predict mental health class selection and correlates based on MLR model 2 clinical symptom variables: Clinically Depressed, Functional Impairment, and Suicidality.

> ***Hypothesis 3a.*** Post-hoc MLR model 1 descriptive predictor variables will estimate correlates of the unknown mental health classes with varying associations of lower or higher odds.
>
> ***Hypothesis 3b.*** Including predictor variables from model 1 in the analyses will show better model fit over the null model.

Hypothesis 3c. Post-hoc MLR model 2 clinical symptom predictor variables will estimate correlates of the unknown mental health classes with varying associations of lower or higher odds.

Hypothesis 3d. Including predictor variables from model 2 in the analyses will show better model fit over the null model.

Chapter 5: Methods

Participants

Nine-hundred fourteen patients EHR data met criterion for a primary mental health diagnosis (ICD-10) and completed clinical measures, such as the ZLDSI and WHODAS therefore were eligible for the present evaluation. Patients were seen in the mental health department of a hospital or clinic setting in Haiti. Patients were referred by community providers, clinical staff, other medical personnel, and traditional healers. The institutional review boards of participating sites that included Partners in Health, Zanmi Lasante, and Teachers College, Columbia University approved all study procedures. The data collection period was from January 2016 to August 2018. The EHR was recently established and patients may have been seen prior to the data collection period. The dataset was presented in Haitian Creole and English. To be eligible, for data inclusion patients had to be 18 years or older and have a primary mental health diagnosis (ICD-10) at the first recorded visit. Patients were excluded if they did not complete the ZLDSI or WHODAS. No patients were excluded based on primary mental health diagnosis or clinical symptom severity. Thus, 914 patients out of the 4,488 patients who were seen during the data collection period were included in the data analysis.

Procedures

Beginning in 2010 there was a collaborative response to the devastating 2010 earthquake, to build a mental health infrastructure by ZL the frontline healthcare team, PIH at Harvard University, the Global Mental Health (GMH) Lab at Teachers College, Columbia University, the

Haitian Ministry of Health, and Grand Challenges Canada (GCC) (Legha, et al., 2013; Raviola, et al., 2012). PRogramme for Improving Mental healthcarE (PRIME) was a consortium that used the Theory of Change (ToC) (Belkin, et al., 2011; Breuer, et al., 2016) to develop integrated mental healthcare systems for primary care in LMICs and introduced these key strategies: (1) assess the context; (2) identify and map priority care pathways; (3) specify decision support tools; (4) develop management infrastructure and use quality improvement practices; and (5) address sustainability, research, and capacity-building *(see figure 1)*. Belkin and colleagues (2011) provided a task-sharing framework that scales the co-created ToC for mental health services using a 5X5 model *(see figure 2)*. The 5X5 model delivers skills packages that determine the appropriate level of care that include: (1) case finding & screening, psychoeducation, follow-up visits for individuals below the clinical threshold, (2) community health care and undergraduate level (e.g., psychology or social work) to deliver interpersonal psychotherapy, (3) psychiatric medication evaluation and interpersonal psychotherapy, (4) acute or severe cases with psychiatric medication management by a primary care physician and interpersonal psychotherapy treatment, and (5) expert mental health care providers to ensure treatment progress and provide quality oversight. The initial clinical care pathway by ZL and PIH focused on treatment for depression and later was adapted to include mental health care pathways for epilepsy and psychotic disorders *(see figures 3-5).* EHR data was utilized in the study, and variables included primary and secondary ICD-10 diagnoses, clinical measures of depression (ZLDSI), functional impairment (WHODAS), and suicidality. Demographic data included age, gender, and delivered treatment location. Other relevant data

points were psychiatric medication type/dosage/frequency, provider type, number of visits during observation period, psychiatric medication received, and psychotherapy received.

Procedures Study 1—Sample Characteristics and Preliminary Analyses.

Gender was recorded as "1" for female or "0" for male and the age with month/day/year of birth was recorded. Age was categorized as 18-27, 28-35, 36-64, and 65 years or older. The ZLDSI "none or mild depression symptoms" were scores of 12 or fewer, and "moderate to severe depression symptoms" were scores of 13 or more. The WHODAS "no impairment" were scores 0 to 12, and "mild to severe" functional impairment were scores of 13 or more. Suicidality was coded "1" for yes, or "0" as no based on the ZLDSI item-12 (see "LCA Indicator Suicide" for full description below).

Figure 1. Theory of Change (ToC)

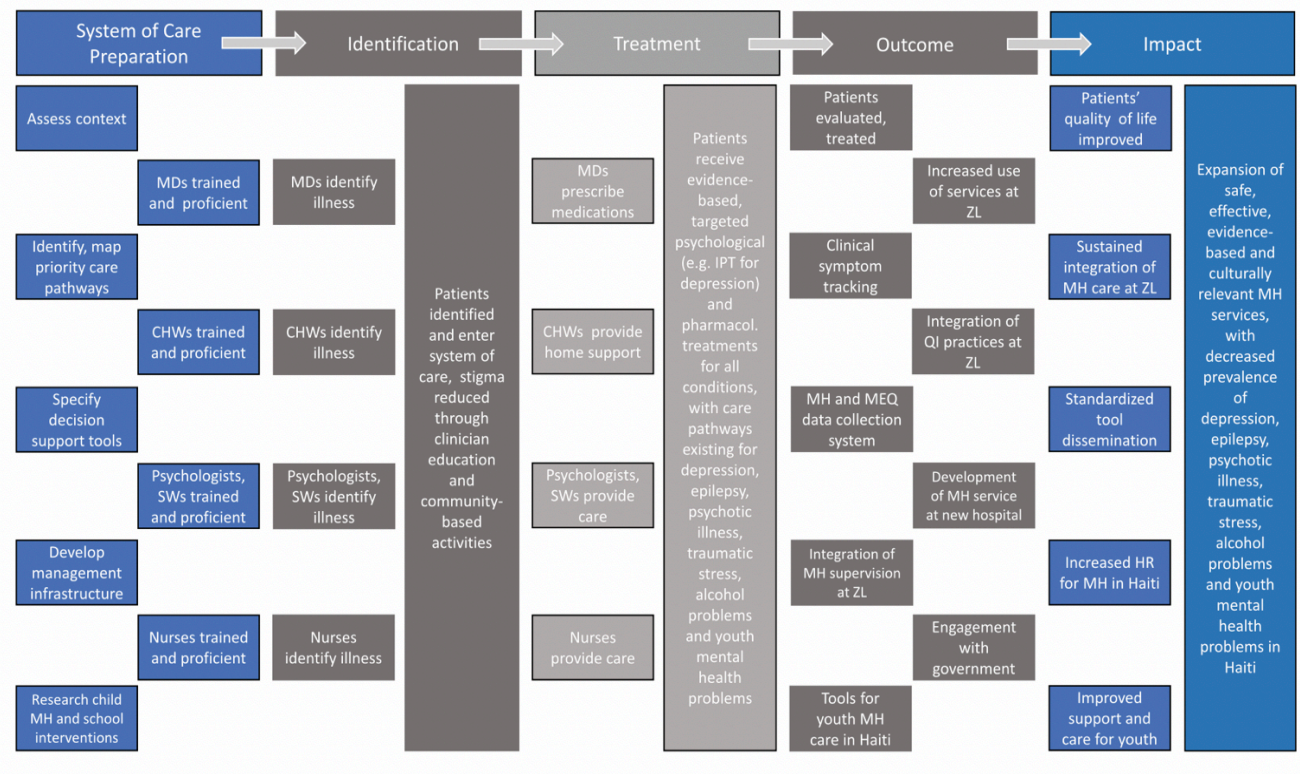


Figure 2. Belkin's 5X5 Model "Pyramid of Care"

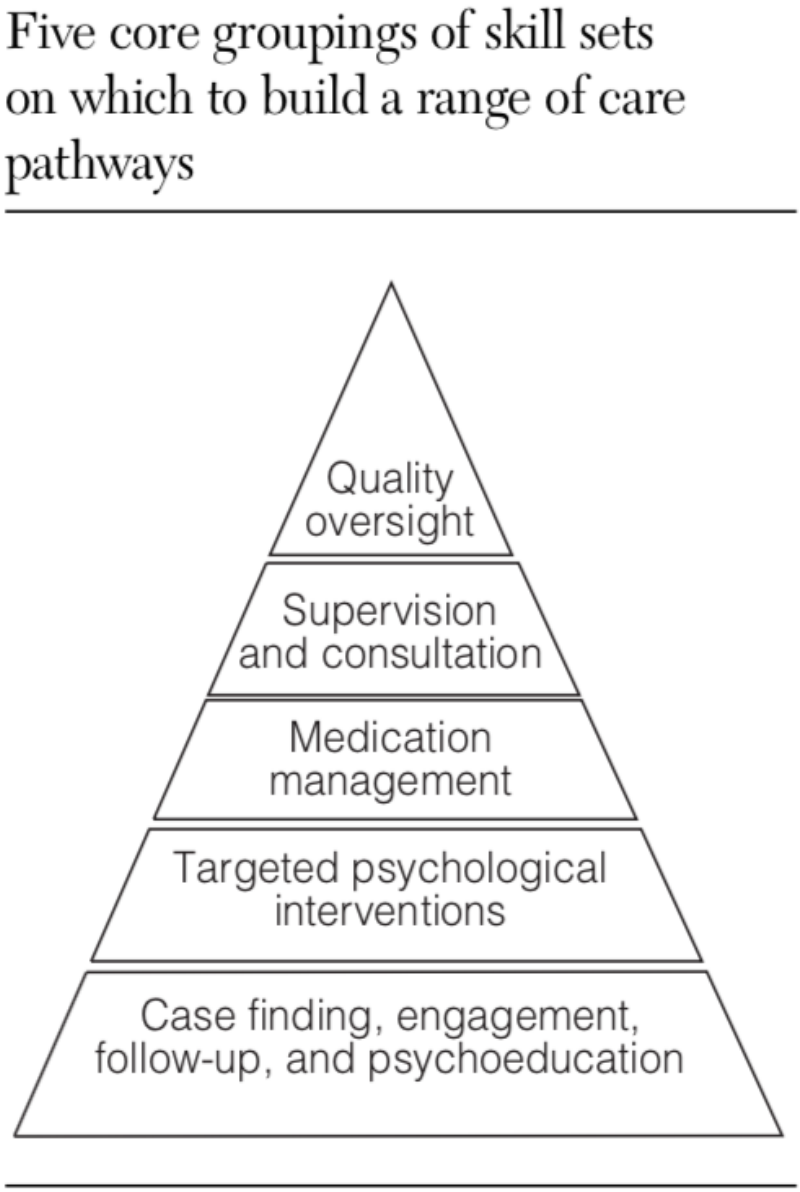


Figure 3. Mental Health Care Pathway: Depression

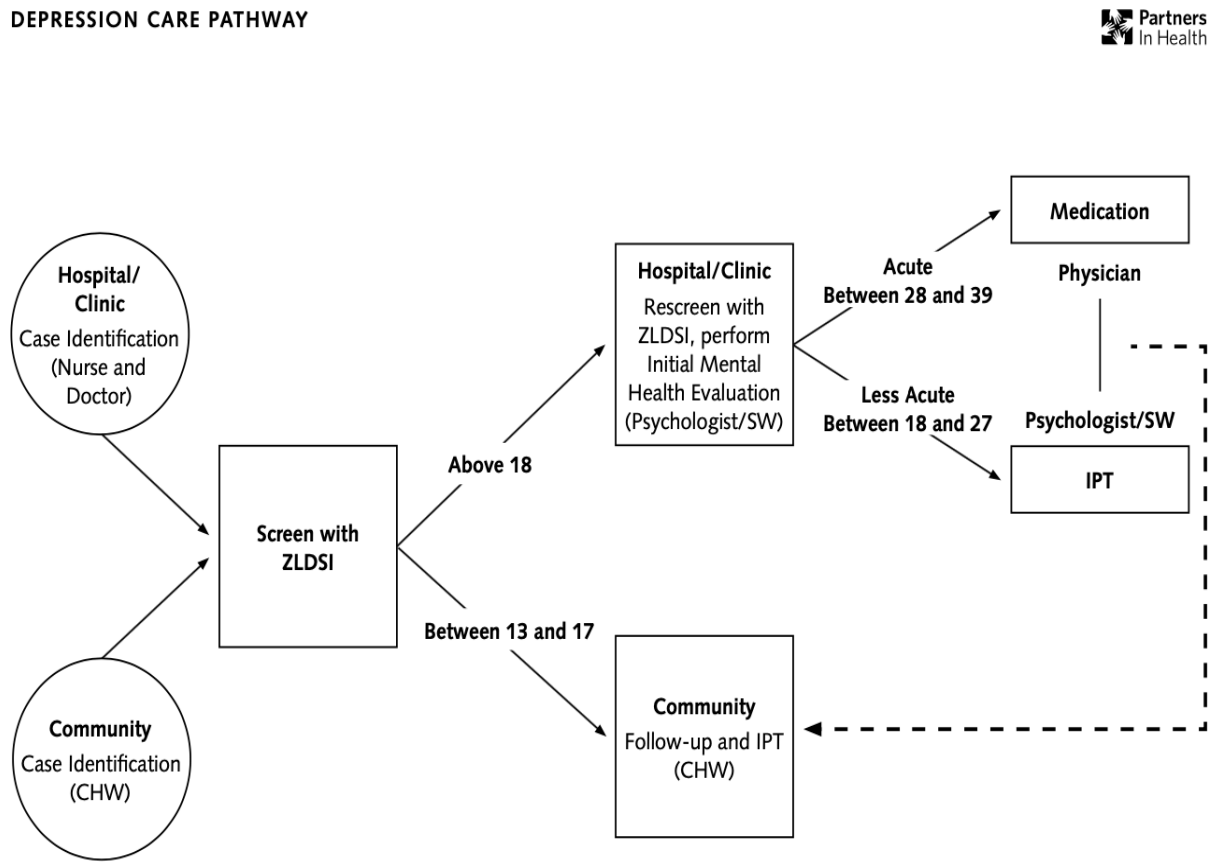


Figure 4. Mental Health Care Pathway: Epilepsy

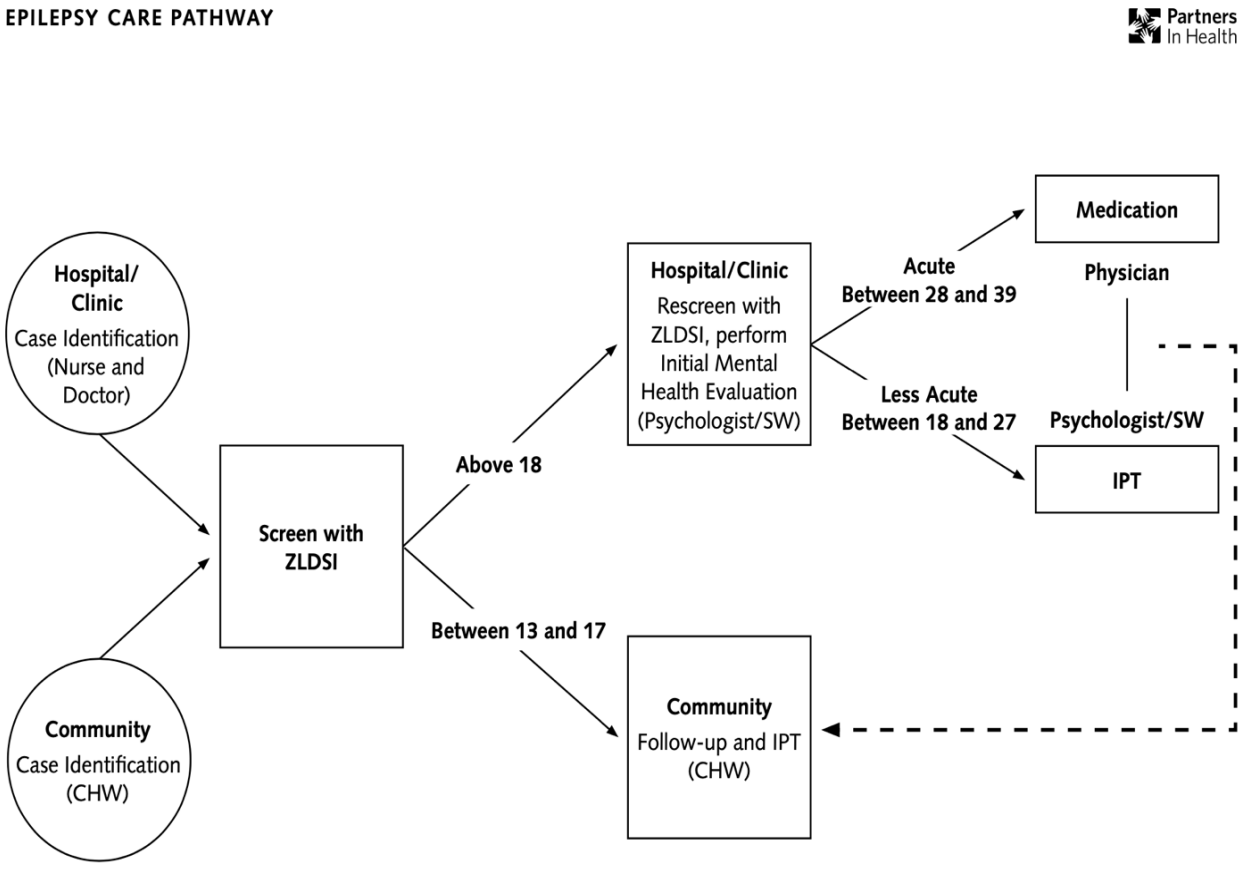
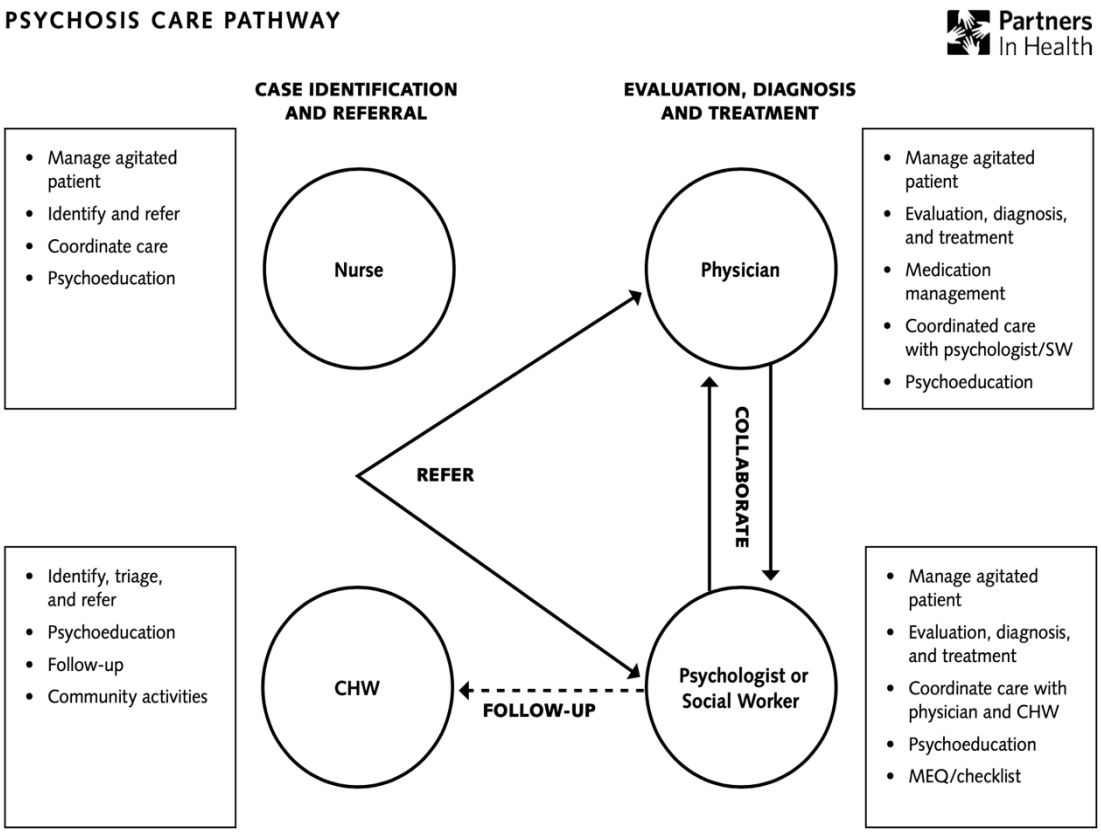


Figure 5. Mental Health Care Pathway: Psychosis



The psychotherapy received variable was coded "1" for yes, or "0" as no, and the psychiatric medication received variable was coded "1" for yes, or "0" as no. Diagnostic categorizations are described in the "LCA Indicators" section below. Delivered treatment location included 13 sites from urban and rural parts of Haiti. Provider type included social workers, psychologists, medical doctor (generalist), psychologists, and nurses. Patients that required higher levels of support with collaborative care team have more than one provider type. The number of visits during the observation period ranged from 1-26. The psychiatric medication types included: anxiolytics, antidepressants, anticonvulsants, and antipsychotics with the associated dosage and frequency.

Procedures Study 2—LCA Indicators

Common Mental Disorders, Severe Mental Disorders, and Neurological Conditions. Standardized semi-structured clinical interviews from PIH and ZL provided the information on psychiatric diagnoses and descriptives. The primary and secondary diagnoses were based on the ICD-10, and after were categorized as CMDs, SMDs, and NCs, which was aligned with previous literature. CMDs according to the NICE Clinical Guidelines include generalized anxiety disorder, panic disorder, phobias, social anxiety disorder, obsessive-compulsive disorder, and post-traumatic stress disorder (National Collaborating Centre for Mental Health, 2011). SMDs include psychosis, schizophrenia, bipolar disorder, and major depression with psychosis (WHO, 2017). NCs include epilepsy, Alzheimer disease and other dementias, cerebrovascular diseases including stroke, migraine and other headache disorders, multiple sclerosis, Parkinson's disease,

neuroinfections, brain tumors, traumatic disorders of the nervous system due to head trauma, and neurological disorders as a result of malnutrition (Kanner, 2006; Lipton et al., 2000; Rickards, 2006; WHO "Mental Health: Neurological Conditions", 2016). Secondary diagnoses were not included as a model indicator but this information was included within the primary diagnosis category to provide further characterization of the LCA subgroups. LCA model indicators included CMDs, SMDs, and NCs that were binary coded as "1" for yes, or "0" as no.

Zanmi Lasante Depression Symptom Inventory Range (ZLDSI). The ZLDSI depression 13-item screening tool has scores that range from 0 to 39 (Rasmussen, et al., 2015). The measure sensitivity score ranges, from 12 to 14 but may not have diagnostic specificity. Therefore, the depression total scores for "mild symptoms" were 1-12. The cutoff score of 13 was used and would indicate a treatment referral that followed the Depression Care Pathway and Epilepsy Care Pathway. Elevated symptom scores for the care pathways were "moderate" 13-17, "less acute" 18-27, and "acute" 28-39. The LCA indicator was based on the ZLDSI total score and coded as binary "1" for mild to severe depression, and "0" when the score was no to mild depression symptoms. Each individual item was scored on a four point 0–3 scale and intended to measure the frequency of distress in the past two weeks, from "not at all" (di tou), "for a few days" (pandan kèkjou), "more than one week" (plis pase yon semèn), to "almost every day" (preske chak jou). The measure was developed to reflect local idioms that describe psychological symptoms specific to Haiti. For example, symptoms of anxiety or depression were described as "ke" or heart problems and psychosis are "te" or head problems. A Haitian-American doctor fluent in French Creole reviewed the scale development that followed the WHO translation guidelines (WHO,

2013). The idioms and translation were checked to ensure the measure reflected cultural norms. The measure showed high internal consistency and construct validity with a Cronbach's alpha of .89. The measure was validated for parts of rural Haiti, and recently validated for a school-age population (Legha, et al., 2020).

Suicidality. Individuals were screened for suicidality using the ZLDSI. ZLDSI item-12 "ou di nan tèt ou: Pito-w te mouri, oubyen ou gen lide pou fè tèt-w mal" or "you say to yourself: you'd rather die, or you intend to hurt yourself." Responses of "non" or "no" were coded 0, and "oui" or "yes" were as coded 1. If suicidal ideation was endorsed each patient was evaluated further and collaboratively established a safety plan with their healthcare provider.

World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0). The WHODAS 2.0 was developed and measures functional impairment in global settings (Üstün, Kostanjsek, Chatterji, & Rehm, 2010). The 12-item measure has an individual item score that ranges from 0–4, and total score that ranges from 0–48. Andrews and colleagues (2004) manuscript provide scoring cutoffs and normative data for the 12-item measure. In "simple scoring," the scores assigned to each of the items include: "none" (0), "mild" (1), "moderate" (2), "severe" (3), "extreme" or "cannot do" (4) and are summed. There are 6 domains that include: cognition, mobility, self-care, getting along with others, life activities, and participation. WHODAS total scores 1–4 were considered "mild functional impairment." The cutoff score of 5 or more was determined to be in the clinical range, and total scores of 5–9 were categorized as "moderate functional impairment," and total scores of 10–48 were categorized as "severe functional impairment." The measure was translated and back translated according to standard practices

(WHO, 2013). The LCA indicator was based on the WHODAS total score and coded as binary "1" for mild to severe functional impairment, which follows the simple scoring method and "0" when the score indicated no functional impairment.

Procedures Study 3—Predictor Variables

Demographic Characteristics (MLR Model 1). The predictor variables included gender (female/male), age (continuous), psychotherapy received (yes/no), psychiatric medication received (yes/no), and number of visits during the observation period (continuous). **Clinical Symptoms (MLR Model 2).** The predictor variables included clinically depressed (continuous), functional impairment (continuous), and suicidality (yes/no).

Data Analysis

Data Analysis Study 1– Sample Characteristics and Preliminary Analyses

Descriptive statistics include gender (female/male), age (18-27; 28-35; 36-64; 65+), depression (ZLDSI) "none or mild depression symptoms" and "moderate to severe depression symptoms", functional impairment (WHODAS 2.0) "no impairment" and "mild to severe functional impairment", suicidality (yes/no), psychotherapy received (yes/no), and psychiatric medication received (yes/no). The primary diagnosis and secondary diagnosis are presented within the indicator category (CMDs, SMDs, NCs). Delivered treatment location, provider type, number of visits during the observation period, psychiatric medication 1 and medication 2 were presented within the primary diagnosis indicator category (CMDs, SMDs, NCs). Psychiatric medication and dosage were included. The tables included the sample size and percentiles. Pearson's correlation matrix and chi-square tests determined group differences. The data was analyzed using SPSS V25.

Data Analysis Study 2–Latent Class Analysis (LCA)

A latent class analysis identifies underlying subgroups or class membership within a large sample size dataset with binary or continuous outcomes (Chih-Chien, 2006; Sullivan, Prescott, & Kendler, 2002). Nine-hundred fourteen patients were included in the LCA analysis with indicators that were known characteristics of mental health. The estimates of fit will be determined using the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) to compare models, both of which are acceptable for interpretation (Wang & Lin, 2006). There is evidence, however, that suggests the BIC while more complex selects the correct model most often the first time (Nylund, Asparouhov, & Muthén, 2007) because it has stricter criteria, and penalizes incorrect models more often. By comparison the AIC while interpretable may overestimate the model by selecting a higher number of classes. The smaller values of AIC and BIC will mean the more interpretable results as it provides identification of distinct latent classes (Akaike, 1973). While the variables included in an LCA analysis can be continuous or categorical, in these analyses the indicators will be binary. LCA indicators included CMDs, SMDs, NCs, Depression, WHODAS, and Suicidality. Interpreted in the model were the AIC, BIC, ABIC, VLMR, and BLRT. The LCA class membership is determined based on the response patterns of each participant in the study. Therefore, the model with r observed binary items, u, has a categorical latent variable, c, with K classes (Clark & Muthén, 2009). The Adjusted Bayesian Information Criterion (ABIC), Vuong Lo-Mendell-Rubin likelihood ratio test (VLMR), and Bootstrap Likelihood Ratio Test (BLRT) are all indices that compare the previous model. Each approach provides goodness of fit indices to include, especially at the single-data level (Lo, Mendell, &

Rubin, 201; Nylund, Asparouhov, & Muthén, 2007). The ABIC reduces the likelihood ratio tests and adjusts the model based on the sample size and provides a more theoretical approach (Nylund, Asparouhov, & Muthén, 2007; Yang & Yang, 2007). The VLMR considers that the normal chi-square difference test is not applicable to compare models (Chen, et al., 2017). Further, the Bootstrap Likelihood Ratio Test (BLRT) has been shown to be less likely to produce type I errors (Nylund, Asparouhov, & Muthén, 2007). The entropy describes how well the individuals were classified into the latent classes, where values closer to 1 indicate a better fit (Celeux & Soromenho, 1996). Therefore, to determine the best fitting model class size, convergence, and posterior probability were evaluated. As research tools diversify in biomedical research and biostatistics, the opportunity to analyze "big data" or large-scale projects has become readily available. Therefore, the present study used data-driven results that could potentially inform more individualized healthcare practices. The latent class analyses (LCA) was run using Mplus version 8.2 (Muthén & Muthén, 2017) from a converted CSV file.

Data Analysis Study 3–Multinomial Logistic Regression (MLR) Models 1 & 2

Multinomial logistic regression (MLR) expands upon binary logistic regression, as the model can include independent variables that are both binary and continuous, and dependent variables that represent unordered categories. For the MLR models the predictor variables of interest were compared individually to the selected mental health subgroups. For MLR model 1 predicator variables included gender, age, psychotherapy received, psychiatric medication received, and number of visits during the observation period. Continuous predictor variables included "age" and "number of visits during the observation." Categorical predictor variables that

were binary included gender “female=1” or “male=0”, and psychotherapy received or psychiatric medication received “yes=1” or “no=0.” For MLR model 2 predicator variables were binary “yes=1” or “no=0” and in the clinical range of moderate to severe, which included clinically depressed, functionally impaired, and suicidality. MLR model results determine the maximum log likelihood through parameter estimates to reduce overall model error (Long & Freeze, 2006; Starkweather & Moske, 2011). Sample size, outliers, and multicollinearity should be evaluated in the model. The likelihood ratio chi-square tests, compare the full model whereas the Pearson’s and Deviance chi-square tests determine the goodness of model fit. Benefits to multinomial logistic regression is it does not assume normality, linearity, or the same variance homoscedasticity (Starkweather & Moske, 2011). Parameter estimates often consider interpretation of the regression coefficients, odds ratios, tests of significance, standard error, and confidence intervals (Osborne, 2012). For these models we included in the tables the odds ratio, standard error, and 95% confidence intervals.

Chapter 6: Results

Study Aim 1– Sample Characteristics and Preliminary Analyses

Table 1 provides sample characteristics for the patients (*N*=914). Patients were mostly female 66.7% and ages ranged from 18-27 (33.8%), 28-35 (17.4%), 36-64 (38.9%), to 65 years and older (4.6%). The ZLDSI depression symptoms included none to mild symptoms (49.8%) and moderate to severe (50.2%). Based on these results 50% of the total sample endorsed moderate to severe depression symptoms. The WHODAS functional impairment symptoms included no impairment (26.5%), and moderate to severe (73.5%). Nearly 75% of the total sample had mild to severe levels of functional impairment, which indicates increased patient debilitation. The results indicate difficulty completing or initiating daily tasks such as communicating, bathing, standing, eating, or engaging effectively in social relationships. Of the total sample, the majority of patients denied suicidal ideation (90%), however, rates were still elevated. Patients in the mental health care pathway whom received psychotherapy were 67.1%, and psychiatric medication were 60.3%. Psychotherapy was interpersonal psychotherapy and psychiatric medication included 4 categories: antidepressants, anxiolytics, anticonvulsants, and antipsychotics.

Primary Diagnosis and Indicator Categories

Primary diagnoses were categorized based on global mental health literature as (WHO, 2017 & 2019) CMDs (*n*=456), SMDs (*n*=164), and NCs (*n*=294) *(see table 2).* Previous LCA literature (Ulbricht, et al., 2018) categorizes the primary diagnosis as the LCA model indicator. The CMDs indicator consisted of International Classification of Diseases 10th Revision (ICD-10)

Table 1. Sample Characteristics (*N*=914)

Measure	*n*	%
Gender		
Female	610	66.7
Male	304	33.3
Age		
18-27	309	33.8
28-35	159	17.4
36-64	356	38.9
65+	42	4.6
Depression (ZLDSI)		
None or Mild Depression Symptoms	455	49.8
Moderate to Severe Depression Symptoms	459	50.2
Functional Impairment (WHODAS)		
No Impairment	242	26.5
Mild to Severe Functional Impairment	672	73.5
Suicidality		
No	823	90.0
Yes	91	10.0
Psychotherapy Received		
No	301	32.9
Yes	613	67.1
Psychiatric Medication Received		
No	363	39.7
Yes	551	60.3

Note. ZLDSI "none or mild depression symptoms" were scores equal to 12 ≤ or fewer. ZLDSI "moderate to severe depression symptoms" were scores equal to 13 ≥ or more. WHODAS "no impairment" were scores 0 to 12 and "mild to severe functional impairment" were scores equal to 13 ≥ or more. The ZLDSI follows the scoring established by the measure, and WHODAS follows the simple scoring methods based on a sum of total positive scores that indicates the patient had some issue with functioning that ranges from mild to severe. Psychotherapy and psychiatric medication received were patients who received clinical treatment as part of the mental health care pathway. System missing included age (*n*=48).

primary diagnoses such as major depression, mild to moderate (45.4%), generalized anxiety disorder (27.2%), and major depression, severe without psychotic features (14.9%). Less frequent were primary diagnoses of acute reaction to a stressor (4.9%), post-traumatic stress disorder (3.9%), adjustment disorder (1.1%), psychosomatic disorder (1.1%), mood disorder (0.9%), obsessive-compulsive disorder (0.2%), personality disorder, not otherwise specified (0.2%), and dissociative conversion disorder (0.2%). The severe mental disorders indicator mostly had primary diagnoses that included psychotic disorder (47.6%), major depressive disorder, with psychotic features (16.5%), and bipolar disorder, unspecified episode (14.6%). SMDs patients were less prone to have a primary diagnosis of bipolar disorder while in a current mood episode, and were rarely on the schizophrenia spectrum or had other psychotic disorders. The SMDs indicator included patients with a primary diagnosis of bipolar disorder, mania without psychotic features (6.1%), delusional disorder (4.9%), schizophrenia (4.9%), bipolar disorder, mania with psychotic features (3.0%), and acute and transient psychotic disorder (2.4%). Over 90% of the NCs indicator included a primary diagnosis of epilepsy (88.8%) and focal epilepsy (2.7%), whereas patients less frequently had migraines (3.1%), dementia (3.1%), intellectual disability (2.7%), pervasive developmental disorder (0.7%), and mixed language disorder (0.3%). The indicators for the LCA analysis therefore, represented for each primary diagnostic indicator category: CMDs (49.9%), SMDs (17.9%), and NCs (32.2%).

Table 2. Primary Diagnosis and Indicator Categories

	n	%
Common Mental Disorders (CMDs) (*n*=456)		
Acute reaction to a stressor	22	4.9
Adjustment disorder	5	1.1
Dissociative conversion disorder	1	0.2
Generalized anxiety disorder	124	27.2
Major depressive disorder, mild to moderate episode	207	45.4
Major depressive disorder, severe without psychotic features	68	14.9
Mood disorder	4	0.9
Obsessive compulsive disorder	1	0.2
Personality disorder, not otherwise specified	2	0.2
Post-traumatic stress disorder	18	3.9
Psychosomatic disorder	5	1.1
Severe Mental Disorders (SMDs) (*n*=164)		
Acute and transient psychotic disorder	4	2.4
Bipolar disorder, unspecified episode	24	14.6
Bipolar disorder, mania with psychotic features	5	3.0
Bipolar disorder, mania without psychotic features	10	6.1
Delusional disorder	8	4.9
Major depressive disorder, with psychotic features	27	16.5
Psychotic disorder	78	47.6
Schizophrenia	8	4.9
Neurological Conditions (NCs) (*n*=294)		
Dementia	9	3.1
Epilepsy	261	88.8
Focal epilepsy	8	2.7
Intellectual disability	4	1.4
Migraine	9	3.1
Mixed language disorder	1	0.3
Pervasive developmental disorder	2	0.7

Note. Of the total sample (*N*=914) 49.9% were common mental disorders, 17.9% were severe mental disorders, and 32.2% were neurological conditions. Those with a mood disorder were on the bipolar spectrum but did not meet diagnostic criterion.

Secondary Diagnosis within the Primary Diagnosis Indicator Categories

Secondary diagnoses for the total sample were infrequent (19.14%), and while not a model indicator, provide further characterization of the primary diagnostic indicator categories *(see table 3)*. The CMDs indicator, revealed patients had a secondary diagnosis that included generalized anxiety disorder (7.7%), major depression, mild to moderate symptoms (4.6%), epilepsy (4.4%), major depression, severe without psychotic features (2.0%), adjustment disorder (1.3%), migraine (0.9%), post-traumatic stress disorder (0.9%), psychosomatic disorder (0.9%), acute reaction to a stressor (0.2%), mood disorder (0.2%), and intellectual disability (0.2%). The CMDs indicator rarely had more acute secondary psychiatric disorders such as psychotic disorder (0.9%), bipolar disorder, unspecified episode (0.4%), bipolar disorder, mania with psychotic features (0.2%), bipolar disorder, mania without psychotic features (0.2%), and delusional disorder (0.2%). For the SMDs indicator, secondary diagnoses included major depression, mild to moderate episode (4.8%), major depression, severe without psychotic features (1.2%), generalized anxiety disorder (1.2%), epilepsy (1.2%), and psychosomatic disorder (0.6%). For the SMDs indicator, a secondary diagnosis also included major depression, severe with psychotic features (1.2%), psychotic disorder (1.2%), schizophrenia (1.2%), bipolar disorder, unspecified episode (0.6%), and delusional disorder (0.6%). For the NCs indicator, the most frequent secondary diagnoses included major depression, mild to moderate (5.8%), intellectual disability (1.4%), major depression, severe without psychotic features (1.0%), and epilepsy (1.0%). Less often (1% or fewer) for the NCs indicator were secondary diagnoses of generalized anxiety disorder (0.7%), acute transient psychotic disorder (0.3%), bipolar disorder, mania with psychotic features (0.3%), major

depression, severe with psychotic features (0.3%), psychotic disorder (0.3%), mood disorder (0.3%), and receptive-expressive language disorder (0.3%). Again, the total sample a comorbid psychiatric diagnosis was less common, and the frequency of a secondary diagnosis for each primary diagnosis indicator category included: CMDs (12.6%), SMDs (0.03%), and NCs (0.04%).

Table 3. Secondary Diagnosis within the Primary Diagnosis Indicator Categories

	n	%
Common Mental Disorders (CMDs) (*n*=115)		
Acute reaction to a stressor	1	0.2
Adjustment disorder	6	1.3
Bipolar disorder, unspecified episode	2	0.4
Bipolar disorder, mania with psychotic symptoms	1	0.2
Bipolar disorder, mania without psychotic symptoms	1	0.2
Delusional disorder	1	0.2
Epilepsy	20	4.4
Generalized anxiety disorder	35	7.7
Intellectual disability	1	0.2
Major depressive disorder, mild to moderate episode	21	4.6
Major depressive disorder, severe without psychotic features	9	2.0
Migraine	4	0.9
Mood disorder	1	0.2
Post-traumatic stress disorder	4	0.9
Psychotic disorder	4	0.9
Psychosomatic disorder	4	0.9
Severe Mental Disorders (SMDs) (*n*=23)		
Bipolar disorder, unspecified episode	1	0.6
Delusional disorder	1	0.6
Epilepsy	2	1.2
Generalized anxiety disorder	2	1.2
Major depressive disorder, mild to moderate episode	8	4.8
Major depressive disorder, severe with psychotic features	2	1.2
Major depressive disorder, severe without psychotic features	2	1.2
Psychotic disorder	2	1.2

	n	%
Psychosomatic disorder	1	0.6
Schizophrenia	2	1.2
Neurological Conditions (NC) (*n*=35)		
Acute transient psychotic disorder	1	0.3
Bipolar disorder, mania with psychotic features	1	0.3
Epilepsy	3	1.0
Generalized anxiety disorder	2	0.7
Intellectual disability	4	1.4
Major depressive disorder, mild to moderate episode	17	5.8
Major depressive disorder, severe without psychotic features	3	1.0
Major depressive disorder, severe with psychotic features	1	0.3
Mood disorder	1	0.3
Psychotic disorder	1	0.3
Receptive-expressive language disorder	1	0.3

Delivered Treatment Locations within the Primary Diagnosis Indicator Categories

In terms of service utilization, mental health coverage was provided the most often to common mental disorders (49.78%), second to neurological conditions (32.2%), and third to severe mental disorders (17.94%) (*see table 4*). The highest proportion of patient volume was at Cange (17%) and Hôpital Universitaire de Mirebalais (15%) across mental disorders, and with exception to neurological conditions that have frequent service engagement at Hinche (22.1%). At Cange, mental health services were provided the most often to common mental disorders (21.7%), second to severe mental disorders (18.9%), and third neurological disorders (8.5%). At Hôpital Universitaire de Mirebalais, mental health services were provided the most often to common mental disorders (17.3%), second to severe mental disorders (14.6%), and third neurological conditions (11.6%). Additionally, for common mental disorders other sites with increased patient

visits were referred for mental health treatment at Saint-Marc HSN (10.7%), Verrettes (8.1%), and Saint-Marc SSPE (7.9%). For severe mental disorders, patients frequently visited Belladère (11.6%), Cerca (8.5%), Boucan-Carré (7.9%), and Saint-Marc SSPE (7.9%). For neurological

Table 4. Delivered Treatment Location within the Primary Diagnosis Indicator Categories

	Common Mental Disorders		Severe Mental Disorders		Neurological Conditions		Row Totals	
	n	%	*n*	%	*n*	%	*n*	%
Delivered Treatment Location								
Belladère	24	5.3	19	11.6	21	7.1	64	0.7
Boucan-Carré	23	5.0	13	7.9	15	5.1	51	0.6
Cange	99	21.7	31	18.9	25	8.5	155	17.0
CDI Klinik Ekstèn Jeneral	28	6.1	10	6.1	31	10.5	69	0.8
Centre de Santé de Thomonde	9	2.0	5	3.0	27	9.2	41	0.5
Cerca	30	6.6	14	8.5	17	5.8	61	0.7
Hinche	11	2.4	10	6.1	65	22.1	86	0.9
Hôpital la Colline de Lascahobas	22	4.8	2	1.2	5	1.7	29	0.3
Hôpital Universitaire de Mirebalais	79	17.3	24	14.6	34	11.6	137	15.0
Petite Rivière	8	1.8	6	3.7	11	3.7	25	0.3
Saint-Marc HSN	49	10.7	12	7.3	6	2.0	67	0.7
Saint-Marc SSPE	36	7.9	13	7.9	21	7.1	70	0.8
Verrettes	37	8.1	5	3.0	16	5.4	58	0.6
Column Totals	**455**	**49.78**	**164**	**17.94**	**294**	**32.2**	**913**	**100**

Note. Delivered Treatment Location was the location where mental health treatment was received and not where the patient resides. The percentages for the row and column totals were calculated based on the total sample (*N*=914).

conditions, patients also visited the CDI Klinik Ekstèn Jeneral (10.5%) and Centre de Santé de Thomonde (9.2%). Results suggest, treatment engagement was observed across varied clinic and hospital outpatient settings.

Provider Type within the Primary Diagnosis Indicator Categories

Treatment service utilization revealed psychologists delivered the majority of services at 83.04% for common mental disorders, severe mental disorders, and neurological conditions (*see table 5*). There was a lack of service delivery from nurses and social workers, and provisions accounted for less than 1% of the total sample. There were few medical doctors available, and generalists regularly delivered mental health services rather than psychiatrists given such specialists were unavailable. Psychologists and medical doctors (generalists) accounted for 11.27% of mental health service delivery for the total sample, which aligned with the PIH and ZL mental health care pathway. Psychologists and medical doctors (generalists) provided the most mental health services to more acute or severe cases that were diagnosed with severe mental disorders (9.2%) and neurological conditions (18.7%).

Table 5. Provider Type within the Primary Diagnosis Indicator Categories

	Common Mental Disorders		Severe Mental Disorders		Neurological Conditions		Row Totals	
	n	%	*n*	%	*n*	%	*n*	%
Provider Type								
Social Worker	1	0.2	0	n/a	2	0.7	3	0.3
Psychologist	405	88.8	136	82.9	218	74.1	759	83.04
Medical Doctor (Generalist)	0	n/a	3	3.0	3	1.0	6	0.6

	n	%	*n*	%	*n*	%	*n*	%
Medical Doctor (Generalist) and Psychologist	33	6.8	15	9.2	55	18.7	103	11.27
Nurse and Psychologist	3	0.6	0	n/a	8	2.8	11	1.0
Nurse, Psychologist, and Medical Doctor (Generalist)	2	0.4	5	3.0	5	1.6	12	1.0
Column Totals	**444**	**48.58**	**159**	**17.4**	**291**	**31.8**	**894**	**97.81**

Note. The percentages for the row and column totals were calculated based on the total sample (*N*=914). There were (*n*=20) missing data points for the provider type.

Number of Visits During the Observation Period within the Primary Diagnosis Indicator Categories

To further understand treatment engagement data was included on the number of visits during the observation period from 2016–2018. The number of mental health visits during the observation period ranged from 1–3 (60.5%), 4–9 (24.62%), and 10–16 (11.38%) for the total sample (*see table 6*). During the observation period 1–3 visits were typical for common mental disorders (72.1%). Severe mental disorders (56.1%) and neurological conditions (44.9%) frequently attended 1–3 visits during the observation period, which suggests these diagnostic groups may not have remained in treatment for a long period of time. Surprisingly, 4–9 visits during the observation period were similar across mental disorders: common mental disorders (21.3%), severe mental disorders (29.9%), and neurological conditions (26.9%). The longest course of mental health treatment, 10–16 visits during the observation period, were for severe mental disorders (11.6%) and neurological conditions (19.7%). Provided the psychological symptoms are less severe, the common mental disorders (11.6%) group rarely attended 10–16

visits during the observation period. Attending 17 or more visits during the observation period accounted for only 3% of the total services delivered for all mental disorders.

Psychiatric Medication within the Primary Diagnosis Indicator Categories

The common mental disorders group most frequently were prescribed antidepressants (medication 1, *n*=130, 28.5%; medication 2, *n*=5, 1.0%) and seldom received antipsychotics (medication 1, *n*=10, 2%; medication 2, *n*=2, 0.4%), anticonvulsants (medication 1, *n*=22, 5%; medication 2, *n*=2, 0.4%), and anxiolytics (medication 1, *n*=2, 0.4%; medication 2, not applicable) *(see table 7)*. The severe mental disorders group were most frequently prescribed antipsychotics (medication 1, *n*=115, 70.12%; medication 2, *n*=4, 2.4%) and rarely received anticonvulsants (medication 1, *n*=7, 4%; medication 2, *n*=9, 5%), antidepressants (medication 1, *n*=5, 3%; medication 2, *n*=3, 2%), and anxiolytics (medication 1, *n*=4, 2.4%; medication 2, not applicable). The neurological conditions group were most frequently prescribed anticonvulsants (medication 1, *n*=235, 80%; medication 2, *n*=5, 2%) and infrequently received antipsychotics (medication 1, *n*=10, 3% medication 2, *n*=1, 1%), and antidepressants (medication 1, *n*=8, 3%; medication 2, *n*=2, 1%). There were no anxiolytics prescribed to the neurological conditions group. Overall, the psychiatric medication type comprised of four categories that included the following dosage and frequency: (1) antidepressants [Amitriptyline 12.5–50 mg PO, Fluoxetine 10-20 mg PO] (2) antipsychotics [Risperidone 0.5–3 mg PO, Haloperidol 0.5–5 mg PO], (3) anticonvulsants PO [Phenytoin 100 mg PO–BID; Carbamazepine 100-200 mg BID–TID; Phenobarbital 50–100 mg BID–TID] and (4) anxiolytics [Diazepam 5 mg PO] *(see table 8)*. Essential psychiatric medications antipsychotics, anticonvulsants, and anxiolytics.

Table 6. Number of Visits During Observation Period within the Primary Diagnosis Indicator Categories

	Common Mental Disorders		Severe Mental Disorders		Neurological Conditions		Row Totals	
	n	%	*n*	%	*n*	%	*n*	%
# of Visits During Observation Period								
1-3	329	72.1	92	56.1	132	44.9	553	60.5
4-9	97	21.3	49	29.9	79	26.9	225	24.62
10-16	27	5.9	19	11.6	58	19.7	104	11.38
17-21	2	0.4	1	0.6	19	6.5	22	2.0
22-26	1	0.2	3	1.8	6	2.0	10	1.0
Column Totals	**456**	**50.0**	**164**	**17.94**	**294**	**32.17**	**914**	**100.0**

Table 7. Psychiatric Medication within the Primary Diagnosis Indicator Categories

	Common Mental Disorders				Severe Mental Disorders				Neurological Conditions				Row Totals			
Psychiatric Medication	1		2		1		2		1		2		1		2	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Anxiolytic																
Diazepam	2	0.4	0	n/a	4	2.4	0	n/a	0	n/a	0	n/a	6	1.0	0	n/a
Anxiolytic Columns Total	**2**	**0.4**	**0**	**n/a**	**4**	**2.4**	**0**	**n/a**	**0**	**n/a**	**0**	**n/a**	**6**	**1.0**	**0**	**n/a**
Antidepressant																
Amitriptyline	74	16.2	3	0.7	1	0.6	1	0.6	6	2.0	2	0.7	81	9.0	6	1.0
Fluoxetine	56	12.3	2	0.4	4	2.4	2	1.2	2	0.7	0	n/a	62	7.0	4	0.4
Antidepressants Columns Total	**130**	**28.5**	**5**	**1.0**	**5**	**3.0**	**3**	**2.0**	**8**	**3.0**	**2**	**1.0**	**143**	**15.6**	**10**	**1.0**

Psychiatric Medication	1		2		1		2		1		2		1		2	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Anticonvulsants																
Phenytoin	1	0.2	0	n/a	1	0.6	0	n/a	22	7.5	1	0.3	24	3.0	1	0.1
Carbamazepine	18	3.9	2	0.4	6	3.7	3	1.8	195	66.3	3	1.0	219	24.0	8	1.0
Phenobarbital	2	0.4	0	n/a	0	n/a	0	n/a	18	6.1	1	0.3	20	2.0	1	0.1
Sodium Valproate	1	0.2	0	n/a	0	n/a	6	3.7	0	n/a	0	n/a	1	0.1	6	1.0
Anticonvulsants Columns Total	**22**	**5.0**	**2**	**0.4**	**7**	**4.0**	**9**	**5.0**	**235**	**80.0**	**5**	**2.0**	**264**	**29.0**	**16**	**2.0**
Antipsychotic																
Risperidone	8	1.8	2	0.4	92	56.1	3	1.8	7	2.4	1	0.3	107	11.7	6	1.0
Haloperidol	2	0.4	0	n/a	23	14.0	1	0.6	3	1.0	0	n/a	28	3.0	1	0.1
Antipsychotic Columns Total	**10**	**2.0**	**2**	**0.4**	**115**	**70.12**	**4**	**2.4**	**10**	**3.0**	**1**	**1.0**	**135**	**14.8**	**7**	**1.0**

Note. The percentages for the column totals were calculated based on the primary diagnosis indicator: common mental disorders (*n*=456), severe mental disorders (*n*=164), and neurological conditions (*n*=294). The percentages for the row totals were calculated based on the total sample (*N*=914).

Table 8. Psychiatric Medication and Dosage

Psychiatric Medication Type	Dose	
	mg	Frequency
Diazepam (anxiolytic)	5	PO
Amitriptyline (antidepressant)	12.5-50	PO
Fluoxetine (antidepressant)	10-20	PO
Phenytoin (anticonvulsant)	100	PO-BID
Carbamazepine (anticonvulsant)	100-200	BID-TID
Phenobarbital (anticonvulsant)	50-100	BID-TID
Risperidone (antipsychotic)	0.5-3	PO
Haloperidol (antipsychotic)	0.5-5	PO

Pearson's Correlation of Descriptive Variables and Primary Diagnosis Indicator Categories

There was a small negative correlation between the neurological conditions and age variables **(***r*(3)= –.13, *p* <.01), and a small positive correlation between common mental disorders and age **(***r*(3)= .08, *p* <.05) variables *(see table 9).* There was a small positive correlation between the neurological conditions and number of visits during observation period **(***r*(3)= .29, *p* <.01), and a small negative correlation between common mental disorders and number of visits during observation period **(***r*(3)= –.28, *p* <.01). There was a moderate negative correlation between common mental disorders and neurological conditions **(***r*(3)= –.69, *p* <.01), and somewhat moderate negative correlation between common mental disorders and severe mental disorders **(***r*(3)= –.32, *p* <.01). There was a moderate negative correlation between common mental disorders and severe mental disorders **(***r*(3)= –.47, *p* <.01). The strength of the relationships overall, was mostly moderate, which suggest group differences, and that descriptive variables such as age and treatment duration had an association with the primary diagnosis that ranged from small to nearly moderate. The Pearson's Correlation of CMDs, SMDs, NCs, and descriptive variables when compared to each primary diagnosis indicator category, suggested that further analysis with LCA and MLR models would be appropriate to evaluate differences.

Table 9. Pearson's Correlation of Descriptive Variables and Primary Diagnosis Indicator Category

		1	2	3	4	5
1	Age					
2	Number of Visits During Observation Period	0				
3	Neurological Conditions	**–.13****	**.29****			
4	Common Mental Disorders	**.08***	**–.28****	**–.69****		
5	Severe Mental Disorders	.06	.02	**–.32****	**–.47****	

Note. Total study sample *(N*=914). Bolded and * p <.05; ** p <.01.

Chi-Square Tests of Descriptive Variables and Primary Diagnosis Indicator Categories

The present study assessed descriptive variables compared to the primary diagnosis indicator categories of common mental disorders, severe mental disorders, and neurological conditions. The common mental disorders group revealed differences on gender ($\chi^2(1, N = 456) = 49.95$, p <.01); psychotherapy received ($\chi^2(1, N = 456) = 17.63$, p <.01); and psychiatric medication received ($\chi^2(1, N = 456) = 229.71$, p <.01) *(see table 10).* The severe mental disorders group revealed differences on gender ($\chi^2(1, N = 164) = 6.06$, p <.05), psychiatric medication received ($\chi^2(1, N = 164) = 32.05$, p <.01), and there were no observed differences for psychiatric medication received *(see table 11).* The neurological conditions group revealed differences on

gender ($\chi^2(1, N = 294) = 30.83$, $p < .01$), psychotherapy received ($\chi^2(1, N = 294) = 21.67$, $p < .01$), and psychiatric medication received ($\chi^2(1, N = 294) = 134.42$, $p < .01$) *(see table 12).*

Table 10. Chi-Square Tests of Descriptive Variables and Common Mental Disorders

Group	*n* (%)	df	χ^2
Gender	355 (77.9%)	**1**	**49.95****
Psychotherapy Received	335 (73.5%)	**1**	**17.63****
Psychiatric Medication Received	164 (36%)	**1**	**229.71****

Note. Common Mental Disorders *(n*=456). Bolded and * $p < .05$; ** $p < .01$.

Table 11. Chi-Square Tests of Descriptive Variables and Severe Mental Disorders

Group	*n* (%)	df	χ^2
Gender	96 (58.5%)	**1**	**6.06***
Psychotherapy Received	111 (67.7%)	1	0.03
Psychiatric Medication Received	131 (79.9%)	**1**	**32.05****

Note. Severe Mental Disorders *(n*=164). Bolded and * $p < .05$; ** $p < .01$.

Table 12. Chi-Square Tests of Descriptive Variables and Neurological Conditions

Group	*n* (%)	df	χ^2
Gender	159 (54.1%)	**1**	**30.83****
Psychotherapy Received	167 (56.8%)	**1**	**21.67****
Psychiatric Medication Received	256 (87.1%)	**1**	**134.42****

Note. Neurological Conditions *(n*=294). Bolded and * $p < .05$; ** $p < .01$.

Chi-Square Tests of Clinical Symptom Variables and Primary Diagnosis Indicator Categories

Further we assessed clinical symptom variables compared to the primary diagnosis indicator categories that included common mental disorders, severe mental disorders, and neurological conditions. The common mental disorders group revealed differences on patients who were clinically depressed ($\chi^2(1, N = 456) = 132.45$, $p < .01$), functionally impaired ($\chi^2(1, N = 456) = 5.95$, $p < .05$), and suicidal ($\chi^2(1, N = 456) = 67.04$, $p < .01$) *(see table 13).* The severe mental disorders group revealed differences on suicidal patients ($\chi^2(1, N = 164) = 57.87$, $p < .01$). There were no statistically significant differences for severe mental disorders on clinical depression or functional impairment *(see table 14).* The neurological conditions group revealed differences on patients who were clinically depressed ($\chi^2(1, N = 294) = 158.16$, $p < .01$), functionally impaired ($\chi^2(1, N = 294) = 14.51$, $p < .01$), and suicidal ($\chi^2(1, N = 294) = 160.76$, $p < .01$) *(see table 15)*. The chi-square tests on descriptive and clinical symptom variables when compared to each primary diagnosis indicator category, have suggested that analysis with LCA and MLR models would be appropriate to further assess these differences.

Table 13. Chi-Square Tests of Clinical Symptoms and Common Mental Disorders

Group	*n* (%)	df	χ^2
Clinically Depressed	317 (69.5%)	**1**	**132.45****
Functionally Impaired	351 (77%)	**1**	**5.95****
Suicidal	10 (2.2%)	**1**	**67.04****

Note. Common Mental Disorders *(n*=456). Bolded and * $p < .05$; ** $p < .01$.

Table 14. Chi-Square Tests of Clinical Symptoms and Severe Mental Disorders

Group	*n* (%)	df	χ^2
Clinically Depressed	84 (51.2%)	1	0.08
Functionally Impaired	128 (78%)	1	2.10
Suicidal	15 (9.1%)	**1**	**57.87****

Note. Severe Mental Disorders *(n*=164). Bolded and * p <.05; ** p <.01.

Table 15. Chi-Square Tests of Clinical Symptoms and Neurological Conditions

Group	*n* (%)	df	χ^2
Clinically Depressed	58 (19.7%)	1	**158.16****
Functionally Impaired	193 (65.6%)	1	**14.51****
Suicidal	66 (22.4%)	**1**	**160.76****

Note. Neurological Conditions *(n*=294). Bolded and * p <.05; ** p <.01.

Study Aim 2–Latent Class Analysis (LCA)

The primary aim of the latent class analysis (LCA) was to observe patterns of mental health in Haiti. The LCA examined associations of known mental health indicators such as the patient's primary diagnosis, clinical symptoms, and functional impairment. Binary–coded indicators in the LCA model included categorizations based on the patient's primary diagnosis such as common mental disorders, severe mental disorders, and neurological conditions. Clinical symptoms were binary indicators as well, and included depression severity based on the ZLDSI first recorded visit total score, and suicidality determined by item-12 on the ZLDSI. To assesses functional impairment the WHODAS first recorded visit total score was included. A series of models were run and the 6-class solution was determined to be the most acceptable model fit,

provided interpretation of decreased Akaike Information Criterion (AIC), decreased Bayesian information criterion (BIC), and decreased sample-size adjusted BIC (SABIC) values *(see table 16)*. When comparing the 5-class model to the 6-class model, the 5-class model revealed larger AIC and BIC values and therefore was less interpretable. Further, model comparisons included the bootstrap methods such as Vuong Lo-Mendell Rubin (VLMR) and Bootstrap Likelihood Ratio Test (BLRT). Bootstrap methods were significant for each model run in the LCA series. Subsequently, the entropy values revealed model distinction, with further comparisons to the 7-class model. Results showed that the 7-class model would lose 5.9% of the information criterion when compared to the 6-class model that held the most model information criterion. Accordingly, the 6-class model was the most interpretable with consideration of the information criterion (BIC, AIC, SABIC), bootstrap methods (VLMR, BLRT), and entropy.

Table 16. Fit Indices for Conditional Latent Classes (6-Class Solution)

Number of Classes	AIC	BIC	SABIC	VLMR	BLRT	Entropy
1	20,232.7	20,276.05	20,247.47			
2	19,139.3	19,226.02	19,168.86	p <.01	p <.01	1.00
3	18,208.53	18,338.61	18,252.86	p <.01	p <.01	1.00
4	17,851.62	18,025.06	17,910.73	p <.01	p <.01	1.00
5	17,519.8	17,736.6	17,593.68	p <.01	p <.01	1.00
6	**17,361.08**	**17,621.24**	**17,449.75**	**p <.01**	**p <.01**	**99.3**
7	17,294.7	17,598.22	17,398.14	p <.01	p <.01	93.4

Note. AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; SABIC = Sample-Size Adjusted Bayesian Information Criterion; VLMR=Vuong Lo-Mendell Rubin; and BLRT = Bootstrap Likelihood Ratio Test. Indicators Included in the Model: Common Mental Disorders, Severe Mental Disorders, Neurological Conditions, First Recorded Visits ZLDSI Score, First Recorded Visit WHODAS Score, and Suicidality.

The model revealed 6 distinct sub-group classes: two classes with common mental disorders (100%), two classes with severe mental disorders (100%), and two classes with neurological conditions (100%). Generally, there were two clinical pathways for common mental disorders, severe mental disorders, and neurological conditions: (1) patients with low clinical symptoms, classes 1–3a and (2) moderate to severe clinical symptoms, 4–6b. Interpretation of class probabilities were based on the Collins & Lanza (2010) guidelines, where values greater than or equal to 50% were considered high and everything else was low. A defining feature of the LCA subgroups were functional impairment probabilities that ranged from "none to low impairment" for classes 1–3a and "high functional impairment" for classes 4–6b. The grouping name is subjective. Provided distinct classes of common mental disorders, severe mental disorders, and neurological conditions, the primary diagnosis categorizations were deemed the most appropriate representation for each grouping name, and further defined by the level of functional impairment. The characterization and class membership probabilities were as follows *(see table 17, figure 6–7)*: Class 1a (*n*=105) membership constituted 11.5% of participants total, the subgroup had a high probability of common mental disorders (100%) with no functional impairment, and therefore were categorized as the "common mental disorders–none to low functional impairment" subgroup. Class 1a revealed low depression (45%) and low suicidality (1%). Class 2a (*n*=45) membership included 4.9% of participants total, the subgroup had a high probability of severe mental disorders (100%) with low functional impairment (19%), and were categorized as the "severe mental disorders–none to low functional impairment" subgroup. Class 3a (*n*=101) membership included

11.1%, the subgroup had a high probability of neurological conditions (100%) and no functional impairment. Therefore, the class was categorized as the "neurological conditions–none to low functional impairment" subgroup. Class 3a revealed low depression (11%) and low suicidality (15%). Again, LCA classes 1–3a were defined by low clinical symptoms and none to low functional impairment. In terms of suicidality, the neurological conditions group 3a (15%) had a stronger probability of being suicidal, when compared to common mental disorders 1a (1%) and severe mental disorders 2a (2%). Class 4b (*n*=353) membership constituted 38.62% of participants total, and the subgroup had a high probability of common mental disorders (100%) and high functional impairment (100%) therefore, were categorized as the "common mental disorders–high functional impairment" subgroup. Clinical depression for class 4b was high (77%) and suicidality was low (3%). Class 5b (*n*=119) membership constituted 13.02% of participants total, and the subgroup had a high probability of severe mental disorders (100%) with high functional impairment (100%) thus, were categorized as the "severe mental disorders–high functional impairment" group. Class 5b the clinical depression probability was high (60%) and suicidality was low (12%). Class 6b (*n*=191) membership constituted 20.9% of participants total, the subgroup had a high probability of neurological conditions (100%) with high functional impairment (100%), and were categorized as the "neurological conditions–high functional impairment" group. For class 6b, the clinical depression probability was low (25%) and suicidality was low (26%). Again, the suicidality for high functional impairment subgroups 4–6b, results showed neurological conditions (26%) had a stronger probability of suicidality, and severe mental disorders were second (12%), and common mental disorders were third with minimal suicidality

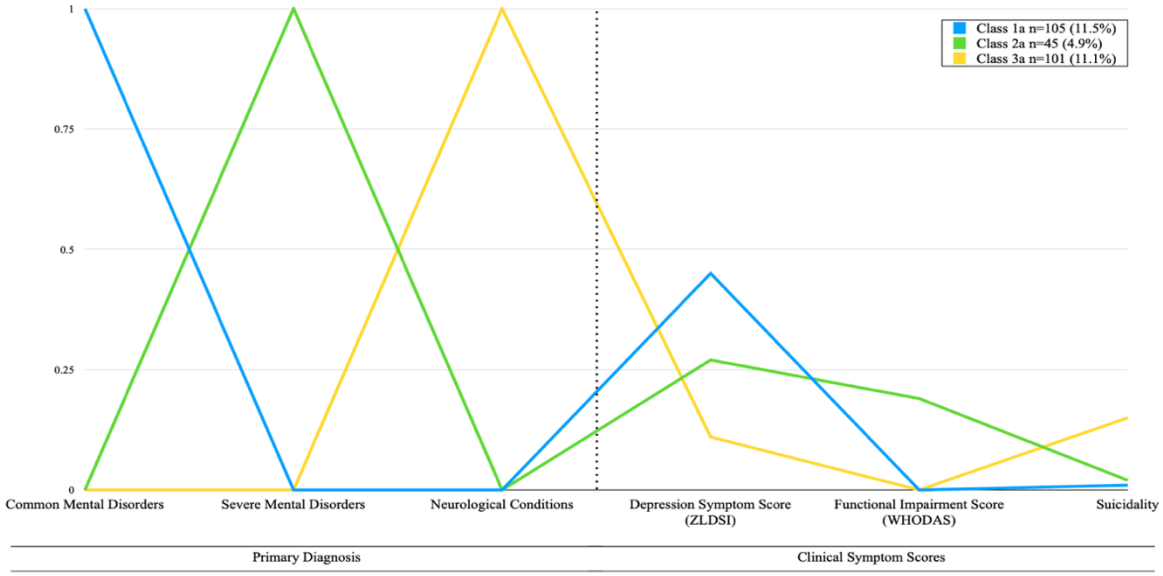
(3%). The six–distinct latent classes (class 1a=11.5%; class 2a=4.9%; class 3a=11.1%; class 4b=38.62%; class 5b=13.02%; and class 6b=20.9%) equal a total of 100%, which denotes that each of the patients belong to one class.

Table 17. Probabilities for Each Indicator (6-Class Model)

Number of Classes	Common Mental Disorders	Severe Mental Disorders	Neurological Conditions	Depression Severity	Functional Impairment	Suicidality
1	**1.00**	0	0	0.45	0	0.01
2	0	**1.00**	0	0.27	0.19	0.02
3	0	0	**1.00**	0.11	0	0.15
4	**1.00**	0	0	**0.77**	**1.00**	0.03
5	0	**1.00**	0	**0.60**	**1.00**	0.12
6	0	0	**1.00**	0.25	**1.00**	0.26

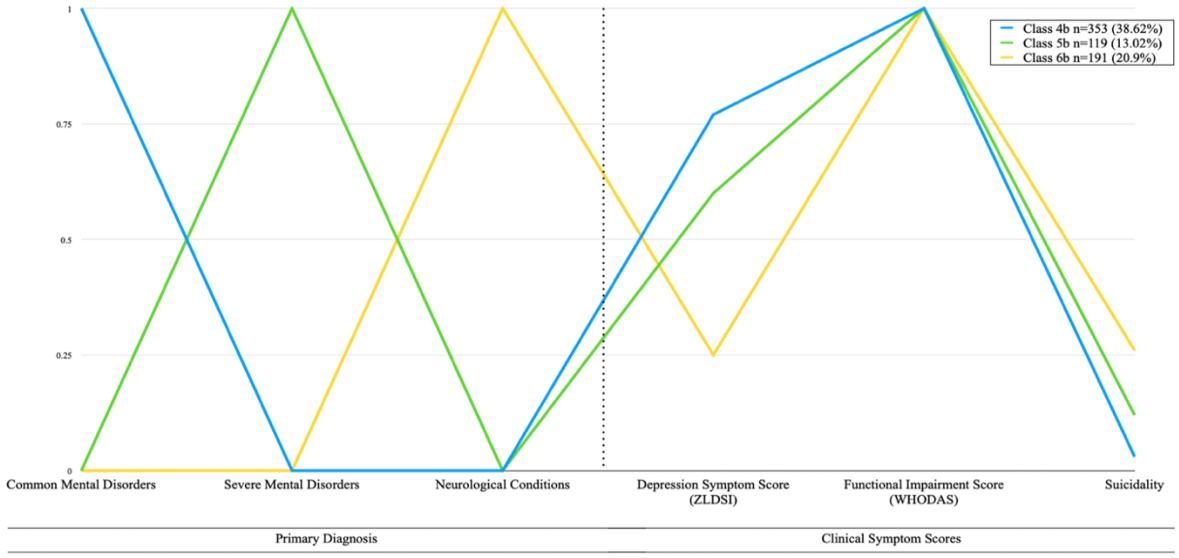
Note. Description of each LCA class based on the primary diagnosis and functional impairment:
LCA Class 1a: CMDs (100%) and no functional impairment
LCA Class 2a: SMDs(100%) and low functional impairment (19%)
LCA Class 3a: NCs (100%) and no functional impairment
LCA Class 4b: CMDs (100%) and high functional impairment (100%)
LCA Class 5b: SMDs (100%) and high functional impairment (100%)
LCA Class 6b: NCs (100%) and high functional impairment (100%)
LCA Classes 1–3a denotes none to low functional impairment
LCA Classes 4–6b denotes high functional impairment

Figure 6. Probabilities for Each Indicator: None to Low Functional Impairment (6-Class Model)



Note. Class 1a "common mental disorder–none to low functional impairment" (*n*=105, 11.5%); Class 2a "severe mental disorders– none to low functional impairment" (*n*=45, 4.9%); and Class 3a "neurological conditions—none to low functional impairment" (*n*= 101, 11.1%).

Figure 7. Probabilities for Each Indicator: High Functional Impairment (6-Class Model)



Note. Class 4b "common mental disorder–high functional impairment" (n=353, 38.62%); Class 5b "severe mental disorders–high functional impairment" (n=119, 13.02%); and Class 6b "neurological conditions—high functional impairment" (n= 191, 20.9%).

Primary and Secondary Diagnosis Proportions within LCA Indicator Categories

The primary diagnosis derived the indicator categories, whereas the secondary diagnosis provided further characterization of each mental health class. The primary diagnosis for class 1a "common mental disorders–none to low functional impairment" were most often major depressive disorder, mild to moderate episode (50.4%) and generalized anxiety disorder (35.2%) *(see table 18)*, whereas the secondary diagnosis for class 1a was most often generalized anxiety disorder (5.8%), major depressive disorder, mild to moderate episode (3%), and epilepsy (1.9%) *(see table 19)*. The primary diagnosis for class 2a "severe mental disorders–none to low functional impairment" was typically, psychotic disorder (57.8%), bipolar disorder, unspecified episode (17.8%), and major depressive disorder, severe with psychotic features (8.9%) *(see table 20)*. The secondary diagnosis for 2a was most often major depressive disorder, mild to moderate episode (4.4%) and epilepsy (2.2%*) (see table 21).* The primary diagnosis for class 3a "neurological conditions–none to low functional impairment" was most often epilepsy (93.1%) *(see table 22)*, and secondary diagnosis major depressive disorder, mild to moderate episode (3%) *(see table 23)*. The primary diagnosis for class 4b "common mental disorders–high functional impairment" was most often major depressive disorder, mild to moderate (43.6%), generalized anxiety disorder (24.6%), and major depressive disorder, severe without psychotic features (18.4%) *(see table 24)*. The secondary diagnosis for class 4b was most often generalized anxiety disorder (8.5%), epilepsy (5.1%), and major depressive disorder, mild to moderate episode (5.1%) *(see table 25)*. The primary diagnosis for class 5b "severe mental disorders–high functional impairment" was most often psychotic disorder (43.7%), major depressive disorder, severe with psychotic features

(19.3%), bipolar disorder, unspecified episode (13.4%), and bipolar disorder, manic episode without psychotic features (7.6%) *(see table 26)*. The secondary diagnosis for class 5b, that was the most frequent included major depressive disorder, mild to moderate episode (5%) *(see table 27)*. The primary diagnosis for class 6b "neurological conditions–high functional impairment" was most often epilepsy (87.4%) *(see table 28)*, and the secondary diagnosis major depressive disorder, mild to moderate episode (5.3%) and epilepsy (2%) *(see table 29)*. Overall, there was consistency for the most frequent primary and secondary diagnoses for CMDs (major depressive disorder, mild to moderate episode), SMDs (psychotic disorder), and NCs (epilepsy); none to low functional impairment (1–3a) and high functional impairment (4–6b). Patients rarely had a secondary diagnosis across LCA subgroups.

Table 18. Primary Diagnosis Proportions within LCA Class 1a (6-Class Model)

	N	*%*
Acute reaction to a stressor	5	4.8
Dissociative conversion disorder	1	1.0
Generalized anxiety disorder	37	35.2
Major depressive disorder, mild to moderate episode	53	50.4
Major depressive disorder, severe without psychotic features	3	2.9
Mood disorder	2	1.9
Post-traumatic stress disorder	4	3.8

Table 19. Secondary Diagnosis Proportions within LCA Class 1a (6-Class Model)

	N	*%*
Epilepsy	2	1.9
Generalized anxiety disorder	6	5.8
Intellectual disability	1	1.0
Major depressive disorder, mild to moderate episode	3	3.0
Migraine	1	1.0
Psychosomatic disorder	1	1.0
Psychotic disorder	1	1.0

Table 20. Primary Diagnosis Proportions within LCA Class 2a (6-Class Model)

	N	*%*
Bipolar disorder, unspecified episode	8	17.8
Bipolar disorder, mania with psychotic features	2	4.4
Bipolar disorder, mania without psychotic features	1	2.2
Delusional disorder	1	2.2
Major depressive disorder, severe with psychotic features	4	8.9
Psychotic disorder	26	57.8
Schizophrenia	3	6.7

Table 21. Secondary Diagnosis Proportions within LCA Class 2a (6-Class Model)

	N	*%*
Epilepsy	1	2.2
Major depressive disorder, mild to moderate episode	2	4.4

Table 22. Primary Diagnosis Proportions within LCA Class 3a (6-Class Model)

	N	*%*
Epilepsy	94	93.1
Focal epilepsy	2	2.0
Intellectual disability	2	2.0
Migraine	3	3.0

Table 23. Secondary Diagnosis Proportions within LCA Class 3a (6-Class Model)

	N	*%*
Epilepsy	1	1.0
Intellectual disability	1	1.0
Major depressive disorder, mild to moderate episode	3	3.0

Table 24. Primary Diagnosis Proportions within LCA Class 4b (6-Class Model)

	N	*%*
Acute reaction to a stressor	17	4.8
Adjustment disorder	5	1.4
Generalized anxiety disorder	87	24.6
Major depressive disorder, mild to moderate episode	154	43.6
Major depressive disorder, severe without psychotic features	65	18.4
Obsessive compulsive disorder	1	0.3
Personality disorder	1	0.3
Pervasive developmental disorder	2	0.6
Mood disorder	2	0.6
Post-traumatic stress disorder	14	4.0
Psychosomatic disorder	5	1.4

Table 25. Secondary Diagnosis Proportions within LCA Class 4b (6-Class Model)

	N	*%*
Acute reaction to a stressor	1	0.3
Adjustment disorder	6	1.7
Bipolar disorder, unspecified episode	4	0.12
Delusional disorder	1	0.3
Epilepsy	18	5.1
Generalized anxiety disorder	30	8.5
Major depressive disorder, mild to moderate episode	18	5.1
Major depressive disorder, severe without psychotic features	9	2.5
Migraine	3	0.8
Mood disorder	1	0.3
Post-traumatic stress disorder	4	1.1
Psychosomatic disorder	3	0.8
Psychotic disorder	3	0.8

Table 26. Primary Diagnosis Proportions within LCA Class 5b (6-Class Model)

	N	*%*
Acute and transient psychotic disorder	4	3.4
Bipolar disorder, unspecified episode	16	13.4
Bipolar disorder, mania with psychotic features	3	2.5
Bipolar disorder, manic episode without psychotic features	9	7.6
Major depressive disorder, severe with psychotic features	23	19.3
Psychotic disorder	52	43.7
Schizophrenia	5	4.2

Table 27. Secondary Diagnosis Proportions within LCA Class 5b (6-Class Model)

	N	*%*
Bipolar disorder, unspecified episode	1	0.8
Delirium	1	0.8
Dementia	1	0.8
Epilepsy	1	0.8
Generalized anxiety disorder	2	1.7

	N	*%*
Major depressive disorder, mild to moderate episode	6	5.0
Major depressive disorder, severe with psychotic features	2	1.7
Major depressive disorder, severe without psychotic features	2	1.7
Psychosomatic disorder	1	0.8
Psychotic disorder	2	1.7
Schizophrenia	2	1.7

Table 28. Primary Diagnosis Proportions within LCA Class 6b (6-Class Model)

	N	*%*
Dementia	9	4.7
Epilepsy	167	87.4
Focal epilepsy	6	3.1
Intellectual disability	2	1.0
Migraine	6	3.1
Mixed language disorder	1	0.5

Table 29. Secondary Diagnosis Proportions within LCA Class 6b (6-Class Model)

	N	*%*
Acute and transient psychotic disorder	1	0.5
Bipolar disorder, unspecified episode	1	0.5
Epilepsy	1	2.0
Generalized anxiety disorder	1	0.5
Intellectual disability	3	1.6
Major depressive disorder, mild to moderate episode	10	5.3
Major depressive disorder, severe with psychotic features	1	0.5
Major depressive disorder, severe without psychotic features	3	1.6
Mood disorder	1	0.5
Psychotic disorder	1	0.5
Receptive-expressive language disorder	1	0.5

Study Aim 3–Multinomial Logistic Regression (MLR) Models 1 & 2

Multinomial Logistic Regression Model 1: Descriptive Predictor Variables

An unordered multinomial logistic regression was used to estimate correlates of descriptive characteristics and treatment information by mental health class. The model included the following independent variables: "gender," "age," "psychotherapy received," "psychiatric medication received," and "number of visits during observation period." The dependent variable was the categorical LCA class membership 1a–6b and the reference categories of "common mental disorders–none to low functional impairment," "severe mental disorders–none to low functional impairment," "neurological conditions–none to low functional impairment," "common mental disorders–high functional impairment," "severe mental disorders–high functional impairment," and "neurological conditions–high functional impairment" selected. The odds ratios (OR) were calculated, and the 95% confidence interval (CI) for each independent variable included, with the significance value set to .05 (*). The goodness of fit was determined based on chi-square tests of Pearson's and deviance. There was no multicollinearity of independent variables and no violations of assumptions met. Sample characteristics of descriptive predictor variables within the LCA class were included for the unordered multinomial logistic regression model 1.

The LCA class 1a "common mental disorders–none to low functional impairment" (*n*=105) included patients that were mostly female (*n*=80, 76.2%) and had a mean age of 36.97 (SD=15.2) (*see table 30–31*). In terms of treatment information, LCA class 1a patients that received psychotherapy were 75.2% (*n*=79) and psychiatric medication were 25.7% (*n*=27), and there were usually 3 patient visits (S.D.=3.35) during the observation period. The LCA class 2a "severe

mental disorders—none to low functional impairment" (*n*=45) included patients that were again, mostly female (*n*=31, 68.9%) and the average age was 38.4 years (S.D.=13.69). For treatment information, patients from class 2a that received psychotherapy were 60% (*n*=27), and received psychiatric medication were 84.4% (*n*=38). There were usually 6 patient visits (S.D.=5.42) during the observation period. The LCA class 3a "neurological conditions—none to low functional impairment" (*n*=101) included patients that were nearly 50% female (*n*=50, 49.5%) and the average age was 31.47 years (S.D.=11.84). LCA class 3a patients received psychotherapy less often at 44.6% (*n*=45), but received psychiatric medication more often (93.1%, *n*=94). There were usually 6 patient visits (S.D.=5.95) during the observation period. LCA class 4b "common mental disorders—high functional impairment" (*n*=353) included patients that were mostly female (*n*=276, 78.2%) and the average age was 37.41 years (S.D.=14.29). In terms of treatment information, patients from class 4b that received psychotherapy were 73.1% (*n*=258), and received psychiatric medication less often at 38.8% (*n*=137). There were usually 3 patient visits (S.D.=3.24) during the observation period. LCA class 5b "severe mental disorders—high functional impairment" (*n*=119) included patients that were mostly female (*n*=65, 54.6%) and the average age was 38.04 years (S.D.=14.06). In terms of treatment information, patients from class 5b frequently received psychotherapy at 70.6% (*n*=84), and also received psychiatric medication more at 78.2% (*n*=93), but were not necessarily seen for treatment longer, compared to LCA classes 1a–4b. For LCA class 5b there were usually 4 patient visits (S.D.=4.20) during the observation period. The LCA class 6b "neurological conditions—high functional impairment" (*n*=191) included patients whom were about 50% female (*n*=108, 56.5%) and the average age was 34.42 years

(S.D.=15.97). Patients for LCA class 6b that received psychotherapy at 62.8% (*n*=120), and more often received psychiatric medication at 84.8% (*n*=162), with usually 6 patient visits (S.D.=6.00) during the observation period. With consideration to the patients overall, we observed that the majority of LCA classes were female, except gender was equally represented for neurological conditions (LCA class 3a and 6b) and severe mental disorders (LCA class 5b). Patients presenting for mental health treatment tended to be 30 years or older. Neurological conditions generally were younger and the ages ranged from 31–34 years of age (LCA classes 3a and 6b). Common mental disorders (LCA classes 1a and 4b), and severe mental disorders (LCA classes 2a and 5b) were somewhat older from 36–38 years of age. For mental health treatment received, "none to low functional impairment" classes (1–3a) received psychotherapy less often than "high functional impairment" classes (4–6b). Psychiatric medication was prescribed the most often to severe mental disorders (LCA classes 2a and 5b) and neurological conditions classes (LCA classes 3a and 6b). Common mental disorders classes (classes 1a and 4b) typically received psychosocial interventions more often, and psychiatric medication less often when compared to the other mental health classes. There were usually 6 visits during the observation period. By comparison, LCA classes 1a, 4b, and 5b had 3 to 4 visits during the observation period.

Table 30. Descriptive Predictor Variables within LCA Class 1–3a

	Class 1a (*n*=105)		Class 2a (*n*=45)		Class 3a (*n*=101)	
	n (%)	*M(SD)*	*n (%)*	*M(SD)*	*n (%)*	*M(SD)*
Gender	80 (76.2)	n/a	31 (68.9)	n/a	50 (49.5)	n/a
Age	n/a	36.97 (15.2)	n/a	38.4 (13.69)	n/a	31.47 (11.84)
Psychotherapy Received	79 (75.2)	n/a	27 (60)	n/a	45 (44.6)	n/a
Psychiatric Medication	27 (25.7)	n/a	38 (84.4)	n/a	94 (93.1)	n/a
# of Visits During Observation Period	n/a	3.30 (3.35)	n/a	6.27 (5.42)	n/a	6.56 (5.95)

Table 31. Descriptive Predictor Variables within LCA Class 4–6b

	Class 4b (*n*=353)		Class 5b (*n*=119)		Class 6b (*n*=191)	
	n (%)	*M(SD)*	*n (%)*	*M(SD)*	*n (%)*	*M(SD)*
Gender	276 (78.2)	n/a	65 (54.6)	n/a	108 (56.5)	n/a
Age	n/a	37.41 (14.29)	n/a	38.04 (14.06)	n/a	34.42 (15.97)
Psychotherapy Received	258 (73.1)	n/a	84 (70.6)	n/a	120 (62.8)	n/a
Psychiatric Medication	137 (38.8)	n/a	93 (78.2)	n/a	162 (84.8)	n/a
# of Visits During Observation Period	n/a	3.16(3.24)	n/a	4.17 (4.20)	n/a	6.52 (6.00)

Multinomial Logistic Regression Model 1: Reference Category 2a "Severe Mental Disorders–None to Low Functional Impairment"

Reference category 2a "severe mental disorders–none to low functional impairment" when compared to the 1a "common mental disorders–none to low functional impairment" group and other variables in the model were held constant, the 1a "common mental disorders–none to low functional impairment" group were much less likely to be on psychiatric medication (OR = 0.08; 95% CI= 0.03, 0.20; $p < .01$) *(see table 32, figure 8)*. Other predictor variables in this model such as gender, age, psychotherapy received, and number of visits during the observation period were not statistically significant. Again, for reference category 2a "severe mental disorders–none to low functional impairment" when other variables in the model were held constant parameter estimates showed when compared to the 3a "neurological conditions–none to low functional impairment" group, patients with "neurological conditions–none to low functional impairment" were somewhat younger (OR = 0.96; 95% CI= 0.94, 1.00; $p < .01$). Other predictor variables in this model such as gender, psychotherapy received, psychiatric medication received, and number of visits during the observation period were not statistically significant. For reference category 2a "severe mental disorders–none to low functional impairment" when other variables in the model were held constant parameter estimates showed when compared to 4b "common mental disorders–high functional impairment" group, patients with "common mental disorders–high functional impairment" were much less likely to be on psychiatric medication (OR = 0.15; 95% CI= 0.06, 0.35; $p < .01$) and had somewhat fewer visits during the observation period (OR = 0.90; 95% CI= 0.84, 0.96; $p < .01$). Other predictor variables in this model such as gender, age, and psychotherapy

received were not statistically significant. For reference category 2a "severe mental disorders–none to low functional impairment" when other variables in the model were held constant parameter estimates showed when compared to the 5b "severe mental disorders–high functional impairment" group, patients with "severe mental disorders–high functional impairment" had somewhat fewer visits during the observation period (OR = 0.93; 95% CI= 0.87, 1.00; $p < .05$). Other predictor variables in this model such as gender, age, psychotherapy received, and psychiatric medication received were not statistically significant. For reference category 2a "severe mental disorders–none to low functional impairment" when other variables in the model were held constant parameter estimates showed when compared to the 6b "neurological conditions–high functional impairment" group, none of the predictor variables were statistically significant. Based on model fitting information, there was significant improvement over the null model [X^2 (25, N= 914) = 373.25, p= < .01]. The Pearson's chi-square test indicated model fit [X^2 (4,410, N=914) =4,330.15, p=0.80] and also the deviance chi-square test indicated model fit [X^2 (4,410, N=914) =2,498.30, p=1.00].

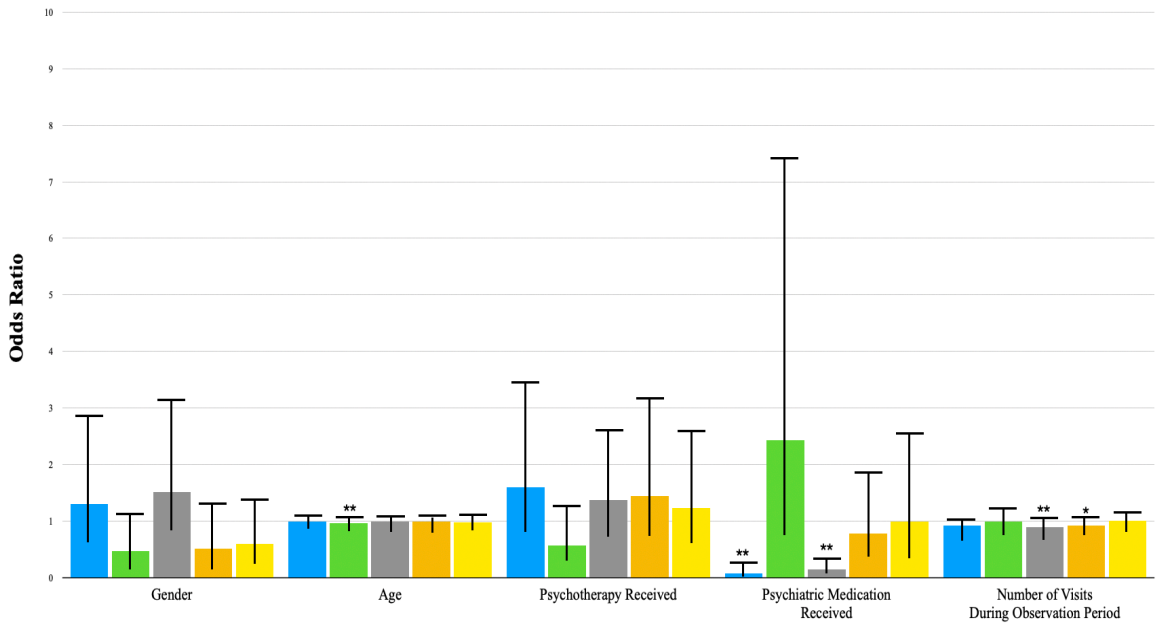
Table 32. Multinomial Logistic Regression for 6-Class Model: Parameter Estimates of Descriptive Predictor Variables for Reference Category SMDs– None to Low Functional Impairment (Class 2a)

Reference Category "SMDs– None to Low Functional Impairment" (Class 2a)	*Odds Ratio*	*Standard Error*	*95% Confidence Interval*
CMDs– None to Low Functional Impairment (Class 1a)			
Gender	1.31	0.41	0.58–2.93
Age	1.00	0.01	0.97–1.02
Psychotherapy Received	1.60	0.40	0.72–3.51
Psychiatric Medication Received	**0.08****	0.48	0.03–0.20
Number of Visits During Observation Period	0.93	0.04	0.86–1.01
NCs– None to Low Functional Impairment (Class 3a)			
Gender	0.48	0.38	0.23–1.02
Age	**0.96****	0.01	0.94–1.00
Psychotherapy Received	0.57	0.38	0.27–1.21
Psychiatric Medication Received	2.43	0.58	0.78–7.54
Number of Visits During Observation Period	1.00	0.03	0.93–1.06
CMDs–High Functional Impairment (Class 4b)			
Gender	1.52	0.36	0.75–3.07
Age	1.00	0.01	0.98–1.02
Psychotherapy Received	1.38	0.35	0.70–2.74
Psychiatric Medication Received	**0.15****	0.43	0.06–0.35
Number of Visits During Observation Period	**0.90****	0.03	0.84–0.96
SMDs– High Functional Impairment (Class 5b)			
Gender	0.52	0.38	0.25–1.09
Age	1.00	0.01	0.98–1.02
Psychotherapy Received	1.44	0.38	0.69–3.02
Psychiatric Medication Received	0.78	0.47	0.30–1.97
Number of Visits During Observation Period	**0.93***	0.04	0.87–1.00
NCs– High Functional Impairment (Class 6b)			
Gender	0.60	0.36	0.30–1.20
Age	0.98	0.01	0.96–1.00

Reference Category "SMDs– None to Low Functional Impairment" (Class 2a)	*Odds Ratio*	*Standard Error*	*95% Confidence Interval*
Psychotherapy Received	1.23	0.35	0.62–2.46
Psychiatric Medication Received	1.00	0.47	0.40–2.47
Number of Visits During Observation Period	1.01	0.03	0.95–1.08

Note. Bolded and * p <.05; ** p <.01. Binary independent variables included: gender (female/male), psychotherapy received (yes/no), and psychiatric medication received (yes/no). Continuous independent variables included: age and number of visits during observation period.

Figure 8. Multinomial Logistic Regression for 6-Class Model: Parameter Estimates of Descriptive Predictor Variables for Reference Category SMDs– None to Low Functional Impairment (Class 2a)



Note. Selected reference category was "SMDs– None to Low Functional Impairment" (Class 2a) and * p <.05; ** p <.01.

Class 1a: CMDs None to Low Functional Impairment
Class 3a: NCs None to Low Functional Impairment
Class 4b: CMDs High Functional Impairment
Class 5b: SMDs High Functional Impairment
Class 6b: NCs High Functional Impairment

Multinomial Logistic Regression Model: Reference category 3a "Neurological Conditions–None to Low Functional Impairment"

Reference category 3a "neurological conditions–none to low functional impairment" when compared to the 1a "common mental disorders–none to low functional impairment" group and other variables in the model were held constant, the "common mental disorders–none to low functional impairment" group were nearly 3 times and much more likely to be female (OR = 2.71; 95% CI= 1.42, 5.20; $p < .01$) and somewhat more likely older (OR = 1.03; 95% CI= 1.01, 1.06; $p < .01$) *(see table 33, figure 9)*. In terms of treatment predictor variables, patients with "common mental disorders–none to low functional impairment" were nearly 3 times and much more likely to receive psychotherapy (OR = 2.78; 95% CI= 1.45, 5.34; $p < .01$) and much less likely to receive psychiatric medication (OR = 0.03; 95% CI= 0.01, 0.08; $p < .01$). The number of visits during the observation period were not statistically significant. Reference category 3a "neurological conditions–none to low functional impairment" when compared to the 2a "severe mental disorders–none to low functional impairment" group and other variables in the model were held constant, the "severe mental disorders–none to low functional impairment" results showed none of the predictor variables were significant. Reference category 3a "neurological conditions–none to low functional impairment" when compared to 4b "common mental disorders–high functional impairment" group and other variables in the model were held constant, the "common mental disorders–high functional impairment" revealed differences for each descriptive variable. LCA class 4b were nearly 3 times and much more likely female (OR = 3.14; 95% CI= 1.88, 5.26; $p <$

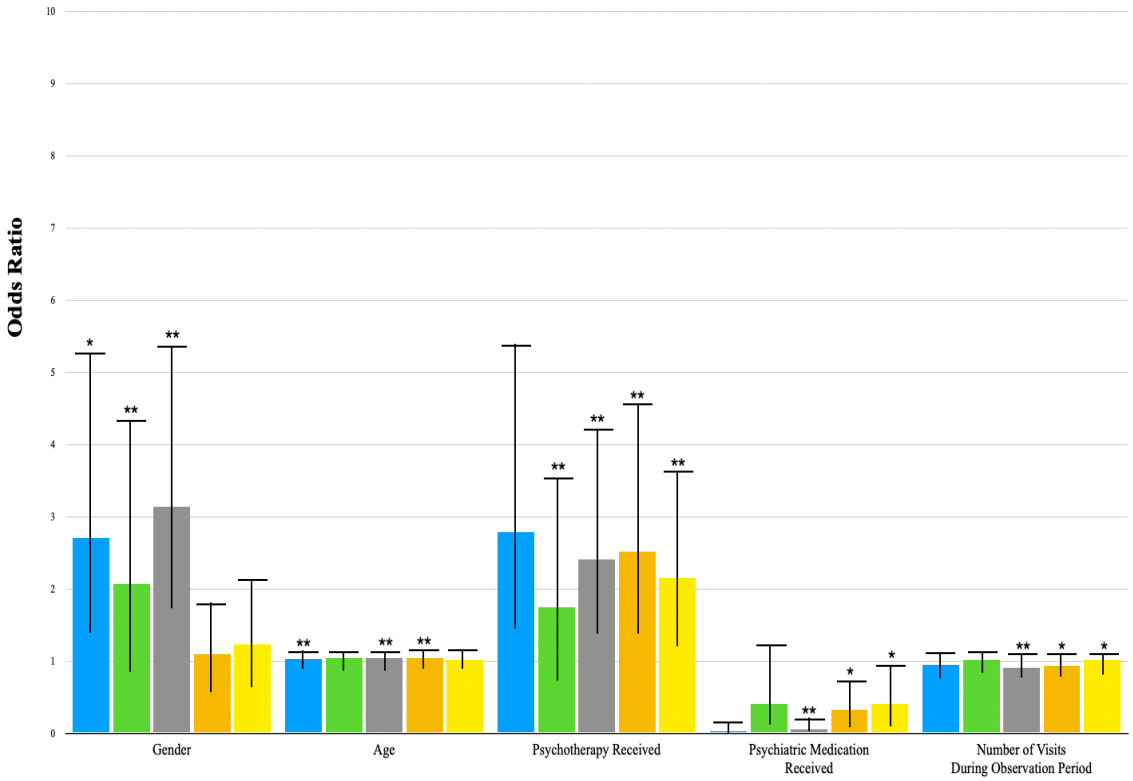
.01) and the patients were somewhat older (OR = 1.04; 95% CI= 1.01, 1.06; $p < .01$). Treatment information revealed that psychotherapy received was 2.5 times and much more likely (OR = 2.51; 95% CI= 1.41, 4.48; $p < .01$); psychiatric medication was less likely (OR = 0.32; 95% CI= 0.13, 0.79; $p < .05$) for class 4b. For class 4b, there were somewhat fewer visits during the observation period (OR = 0.93; 95% CI= 0.88, 1.00; $p < .05$). Reference category 3a "neurological conditions–none to low functional impairment" when compared to 5b "severe mental disorders–high functional impairment" group and other variables in the model were held constant, the "severe mental disorders–high functional impairment" group were somewhat older (OR = 1.04; 95% CI= 1.02, 1.06; $p < .01$); 2.5 times and much more likely to receive psychotherapy (OR = 2.51; 95% CI= 1.41, 4.48; $p < .01$); less likely to receive psychiatric medication (OR = 0.32; 95% CI= 0.13, 0.79; $p < .05$); had somewhat fewer visits during the observation period (OR = 0.93; 95% CI= 0.88, 1.00; $p < .05$); and gender was not statistically significant. Reference category 3a "neurological conditions–none to low functional impairment" when compared to 6b "neurological conditions–high functional impairment" group and other variables in the model were held constant, the "neurological conditions–high functional impairment" group were 2 times and much more likely to receive psychotherapy (OR = 2.15; 95% CI= 1.30, 3.58; $p < .01$) and were less likely to receive psychiatric medication (OR = 0.41; 95% CI= 0.17, 0.98; $p < .05$). Other descriptive variables such as gender, age, and number of visits during the observation period were not statistically significant. Based on model fitting information, there was significant improvement over the null model [X^2 (25, N= 914) = 373.25, p= < .01]. The Pearson's chi-square test indicated model fit [X^2 (4,410, N=914) =4,330.15, p=0.80] and also the deviance chi-square test indicated

Table 33. Multinomial Logistic Regression for 6-Class Model: Parameter Estimates of Descriptive Predictor Variables for Reference Category NCs– None to Low Functional Impairment (Class 3a)

Reference Category "NCs– None to Low Functional Impairment" (Class 3a)	*Odds Ratio*	*Standard Error*	*95% Confidence Interval*
CMDs– None to Low Functional Impairment (Class 1a)			
Gender	**2.71****	0.33	1.42–5.20
Age	**1.03****	0.01	1.01–1.06
Psychotherapy Received	**2.78****	0.33	1.45–5.34
Psychiatric Medication Received	**0.03****	0.46	0.01–0.08
Number of Visits During Observation Period	0.94	0.04	0.87-1.01
SMDs– None to Low Functional Impairment (Class 2a)			
Gender	2.07	0.38	0.98–4.39
Age	1.04	0.01	1.01–1.06
Psychotherapy Received	1.75	0.38	0.83–3.68
Psychiatric Medication Received	0.41	0.58	0.13–1.28
Number of Visits During Observation Period	1.01	0.03	0.94-1.07
CMDs– High Functional Impairment (Class 4b)			
Gender	**3.14****	0.26	1.88–5.26
Age	**1.04****	0.01	1.01–1.06
Psychotherapy Received	**2.41****	0.26	1.44–4.04
Psychiatric Medication Received	**0.06****	0.42	0.03–0.14
Number of Visits During Observation Period	**0.90****	0.03	0.86-0.95
SMDs– High Functional Impairment (Class 5b)			
Gender	1.09	0.28	0.63–1.88
Age	**1.04****	0.01	1.02–1.06
Psychotherapy Received	**2.51****	0.30	1.41–4.48
Psychiatric Medication Received	**0.32***	0.46	0.13–0.79
Number of Visits During Observation Period	**0.93***	0.03	0.88–1.00
NCs– High Functional Impairment (Class 6b)			
Gender	1.23	0.25	0.76–2.02
Age	1.02	0.01	1.00–1.04
Psychotherapy Received	**2.15****	0.26	1.30–3.58
Psychiatric Medication Received	**0.41***	0.45	0.17–0.98

Note. Bolded and * p <.05; ** p <.01. Binary independent variables included: gender (female/male), psychotherapy received (yes/no), and psychiatric medication received (yes/no). Continuous independent variables included: age and number of visits during observation period.

Figure 9. Multinomial Logistic Regression for 6-Class Model: Parameter Estimates of Descriptive Predictor Variables for Reference Category NCs–None to Low Functional Impairment (Class 3a)



Note. Selected reference category was "NCs–None to Low Functional Impairment" (Class 3a) and * $p < .05$; ** $p < .01$.

Class 1a: CMDs None to Low Functional Impairment
Class 2a: SMDs None to Low Functional Impairment
Class 4b: CMDs High Functional Impairment
Class 5b: SMDs High Functional Impairment
Class 6b: NCs High Functional Impairment

Multinomial Logistic Regression Model 1: Reference Category 4b "Common Mental Disorders–High Functional Impairment"

Reference category 4b "common mental disorders–high functional impairment" when compared to the 1a "common mental disorders–none to low functional impairment" group and other variables in the model were held constant, the "common mental disorders–none to low functional impairment" group were less likely to receive psychiatric medication (OR = 0.52; 95% CI= 0.32, 0.85; $p < .05$), and descriptive variables: gender, age, psychotherapy received, and the number of visits during observation period were not statistically significant *(see table 34, figure 10)*. Reference category 4b "common mental disorders–high functional impairment" when compared to 2a "severe mental disorders–none to low functional impairment" group and other variables in the model were held constant, the "severe mental disorders–none to low functional impairment" results showed patients were more than 6.5 times and much more likely to receive psychiatric medication (OR = 6.74; 95% CI= 2.88, 15.79; $p < .01$), and had more visits during the observation period (OR = 1.11; 95% CI= 1.05, 1.17; $p < .01$), and descriptive variables: gender, age, and psychotherapy received were not statistically significant. Reference category 4b "common mental disorders–high functional impairment" when compared to 3a "neurological conditions–none to low functional impairment" group and other variables in the model were held constant, the "neurological conditions–none to low functional impairment" revealed differences for each descriptive variable. LCA class 3a was much less likely to be female (OR = 0.32; 95% CI= 0.19, 0.53; $p < .01$) and patients were somewhat younger (OR = 0.97; 95% CI= 0.95, 1.00; $p < .01$). Treatment information for the LCA class 3a subgroup, revealed that psychotherapy

received was much less likely (OR = 0.42; 95% CI= 0.25, 0.70; $p < .01$); psychiatric medication was 16 times and much more likely (OR = 0.32; 95% CI= 0.13, 0.79; $p < .01$); and there were more visits during the observation period (OR = 1.11; 95% CI= 1.05, 1.17; $p < .01$). Reference category 4b "common mental disorders–high functional impairment" when compared to 5b "severe mental disorders–high functional impairment" group and other variables in the model were held constant, the "severe mental disorders–high functional impairment" group were much less likely female (OR = 0.35; 95% CI= 0.22, 0.55; $p < .01$), and 5 times and much more likely to receive psychiatric medication (OR = 5.23; 95% CI= 3.17, 8.61; $p < .01$). Other descriptive variables such as age, psychotherapy received, and the number of visits during observation period were not statistically significant. Reference category 4b "common mental disorders–high functional impairment" when compared to 6b "neurological conditions–high functional impairment" group and other variables in the model were held constant, the "neurological conditions–high functional impairment" group were much less likely female (OR = 0.39; 95% CI= 0.26, 0.60; $p < .01$); about the same age (OR = 1.00; 95% CI= 0.97, 1.00; $p < .01$); 6.5 times and much more likely to receive psychiatric medication (OR = 6.67; 95% CI= 4.18, 10.64; $p < .01$); had more visits during the observation period (OR = 1.13; 95% CI= 1.08, 1.18; $p < .01$); and psychotherapy received was not statistically significant. Based on model fitting information, there was significant improvement over the null model [X^2 (25, N= 914) = 373.25, p= < .01]. The Pearson's chi-square test indicated model fit [X^2 (4,410, N=914) =4,330.15, p=0.80] and also the deviance chi-square test indicated model fit [X^2 (4,410, N=914) =2,498.30, p=1.00].

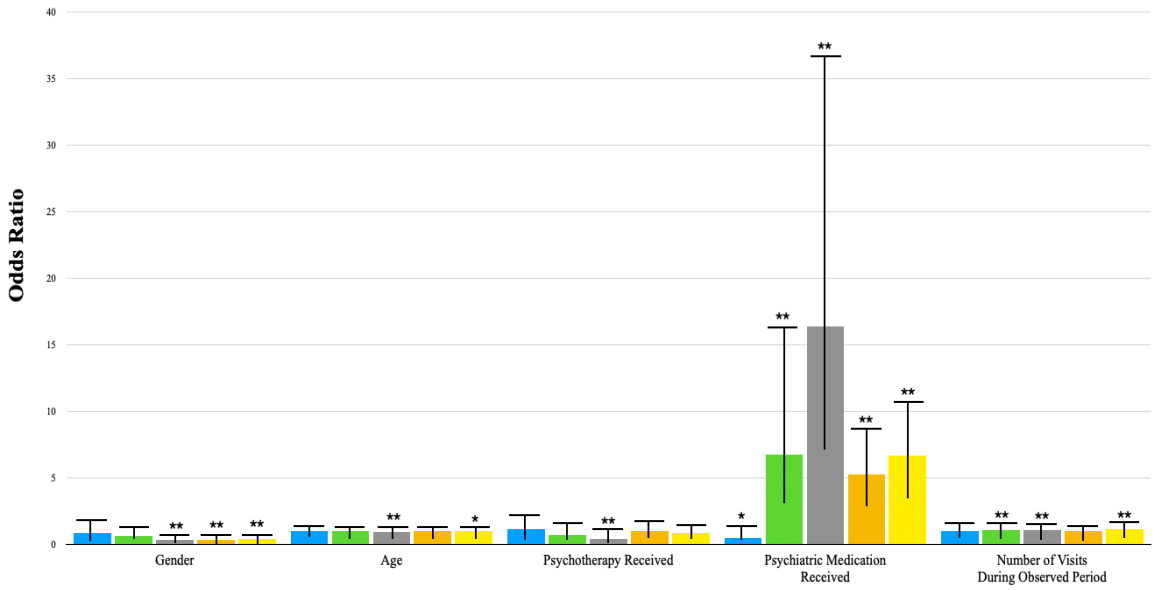
Table 34. Multinomial Logistic Regression for 6-Class Model: Parameter Estimates of Descriptive Predictor Variables with Reference Category CMDs– High Functional Impairment (Class 4b)

Reference Category "CMDs– High Functional Impairment" (Class 4b)	*Odds Ratio*	*Standard Error*	*95% Confidence Interval*
CMDs– None to Low Functional Impairment (Class 1a)			
Gender	0.86	0.27	0.51–1.45
Age	1.00	0.01	0.98–1.01
Psychotherapy Received	1.15	0.26	0.69–1.92
Psychiatric Medication Received	**0.52***	0.26	0.32–0.85
Number of Visits During Observation Period	1.04	0.03	0.97-1.11
SMDs– None to Low Functional Impairment (Class 2a)			
Gender	0.66	0.36	0.33–1.34
Age	1.00	0.01	0.98–1.03
Psychotherapy Received	0.73	0.35	0.37–1.44
Psychiatric Medication Received	**6.74****	0.43	2.88–15.79
Number of Visits During Observation Period	**1.11****	0.03	1.04-1.19
NCs– None to Low Functional Impairment (Class 3a)			
Gender	**0.32****	0.26	0.19–0.53
Age	**0.97****	0.01	0.95–1.00
Psychotherapy Received	**0.42****	0.26	0.25–0.70
Psychiatric Medication Received	**16.36****	0.42	7.22–37.09
Number of Visits During Observation Period	**1.11****	0.03	1.05-1.17
SMDs– High Functional Impairment (Class 5b)			
Gender	**0.35****	0.24	0.22–0.55
Age	1.00	0.01	1.00–1.02
Psychotherapy Received	1.04	0.25	0.64–1.71
Psychiatric Medication Received	**5.23****	0.26	3.17–8.61
Number of Visits During Observation Period	1.03	0.03	0.97-1.09

Reference Category "CMDs– High Functional Impairment" (Class 4b)	*Odds Ratio*	*Standard Error*	*95% Confidence Interval*
NCs– High Functional Impairment (Class 6b)			
Gender	**0.39****	0.22	0.26–0.60
Age	**1.00***	0.01	0.97–1.00
Psychotherapy Received	0.89	0.22	0.58–1.38
Psychiatric Medication Received	**6.67****	0.24	4.18–10.64
Number of Visits During Observation Period	**1.13****	0.02	1.08-1.18

Note. Bolded and * p <.05; ** p <.01. Binary independent variables included: gender (female/male), psychotherapy received (yes/no), and psychiatric medication received (yes/no). Continuous independent variables included: age and number of visits during observation period.

Figure 10. Multinomial Logistic Regression for 6-Class Model: Parameter Estimates of Descriptive Predictor Variables with Reference Category CMDs– High Functional Impairment (Class 4b)



Note. Selected reference category was "CMDs– High Functional Impairment" (Class 4b) and * p <.05; ** p <.01.

Multinomial Logistic Regression Model 1: Reference Category 5b "Severe Mental Disorders–High Functional Impairment"

Reference category 5b "severe mental disorders–high functional impairment" when compared to 1a "common mental disorders–none to low functional impairment" group and other variables in the model were held constant, the "common mental disorders–none to low functional impairment" group were 2.5 times and much more likely to be female (OR = 2.50; 95% CI= 1.36, 4.59; $p < .01$); much less likely to receive psychiatric medication (OR = 0.10; 95% CI= 0.05, 0.19; $p < .01$); and other descriptive variables such as age, psychotherapy received, and the number of visits during observation period were not statistically significant *(see table 35, figure 11).* Reference category 5b "severe mental disorders–high functional impairment" when compared to 2a "severe mental disorders–none to low functional impairment" group and other variables in the model were held constant, the "severe mental disorders–none to low functional impairment" results showed patients had more visits during the observation period (OR = 1.08; 95% CI= 1.01, 1.16; $p < .05$); and other descriptive variables: gender, age, psychotherapy received, and psychiatric medication received were not statistically significant. Reference category 5b "severe mental disorders–high functional impairment" when compared to 3a "neurological conditions–none to low functional impairment" group and other variables in the model were held constant, the "neurological conditions–none to low functional impairment" results showed patients were somewhat younger (OR = 0.96; 95% CI= 0.94, 0.98; $p < .01$); much less likely to receive psychotherapy (OR = 0.40; 95% CI= 0.22, 0.71; $p < .01$); 3 times and more likely to receive psychiatric medication (OR = 3.13; 95% CI= 1.27, 7.70; $p < .05$); had more visits during the

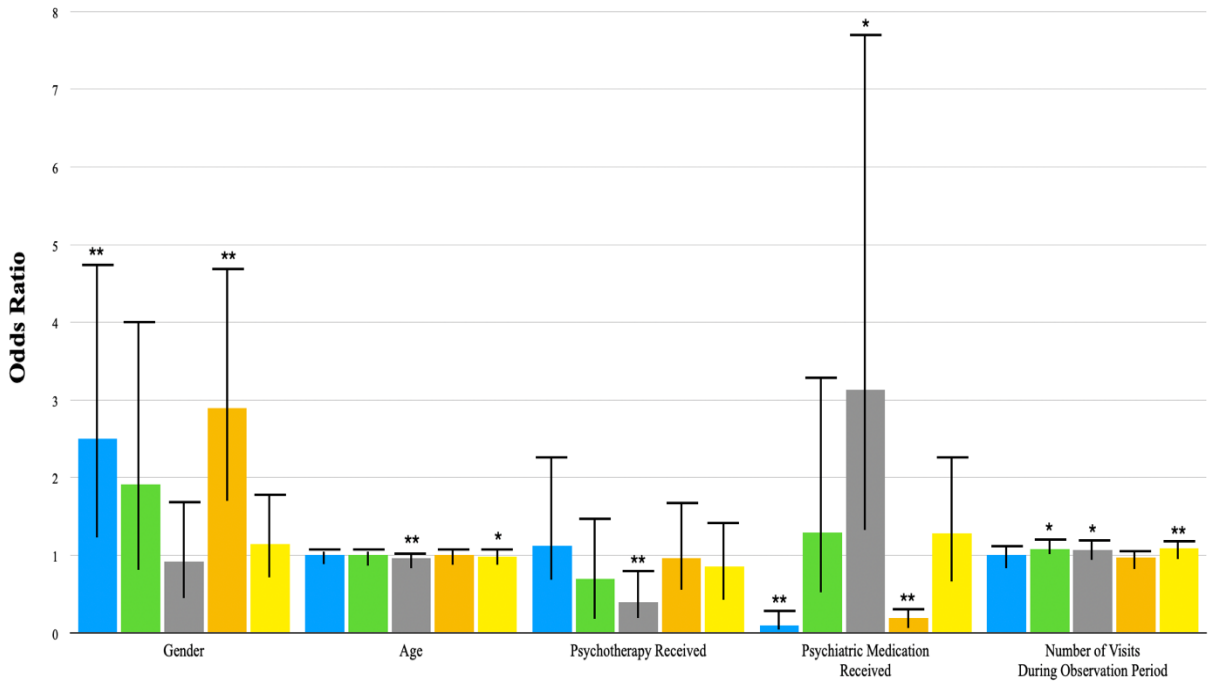
observation period (OR = 1.07; 95% CI= 1.01, 1.14; $p < .05$); and gender was not statistically significant. Reference category 5b "severe mental disorders–high functional impairment" when compared to 4b "common mental disorders–high functional impairment" group and other variables in the model were held constant, the "common mental disorders–high functional impairment" results showed patients were nearly 3 times and much more likely female (OR = 2.90; 95% CI= 1.82, 4.61; $p < .01$) and much less likely to receive psychiatric medication (OR = 0.19; 95% CI= 0.12, 0.32; $p < .01$). Other descriptive variables such as age, psychotherapy received, and number of visits during the observation period were not statistically significant. Reference category 5b "severe mental disorders–high functional impairment" when compared to 6b "neurological conditions–high functional impairment" group and other variables in the model were held constant, the "neurological conditions–high functional impairment" results showed patients were somewhat younger (OR = 0.98; 95% CI= 0.97, 1.00; $p < .05$) and attended more visits during the observation period (OR = 1.09; 95% CI= 1.04, 1.15; $p < .01$). Other descriptive variables such as gender, psychotherapy received, and psychiatric medication received were not statistically significant. Based on model fitting information, there was significant improvement over the null model [X^2 (25, N= 914) = 373.25, p= < .01]. The Pearson's chi-square test indicated model fit [X^2 (4,410, N=914) =4,330.15, p=0.80] and also the deviance chi-square test indicated model fit [X^2 (4,410, N=914) =2,498.30, p=1.00].

Table 35. Multinomial Logistic Regression for 6-Class Model: Parameter Estimates of Descriptive Predictor Variables with Reference Category SMDs– High Functional Impairment (Class 5b)

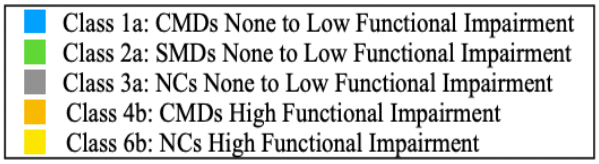
Reference Category "SMDs– High Functional Impairment" (Class 5b)	*Odds Ratio*	*Standard Error*	*95% Confidence Interval*
CMDs– None to Low Functional Impairment (Class 1a)			
Gender	**2.50****	0.31	1.36–4.59
Age	1.00	0.01	0.98–1.01
Psychotherapy Received	1.12	0.32	0.59–2.08
Psychiatric Medication	**0.10****	0.32	0.05–0.19
Number of Visits During Observation Period	1.00	0.04	0.93–1.08
SMDs– None to Low Functional Impairment (Class 2a)			
Gender	1.91	0.38	0.92–3.99
Age	1.00	0.01	0.98–1.02
Psychotherapy Received	0.70	0.38	0.33–1.46
Psychiatric Medication	1.29	0.48	0.51–3.28
Number of Visits During Observation Period	**1.08***	0.04	1.01-1.16
NCs– None to Low Functional Impairment (Class 3a)			
Gender	0.92	0.28	0.53–1.60
Age	**0.96****	0.01	0.94–0.98
Psychotherapy Received	**0.40****	0.29	0.22–0.71
Psychiatric Medication	**3.13***	0.46	1.27–7.70
Number of Visits During Observation Period	**1.07***	0.03	1.01-1.14
CMDs– High Functional Impairment (Class 4b)			
Gender	**2.90****	0.24	1.82–4.61
Age	1.00	0.01	0.98–1.01
Psychotherapy Received	0.96	0.25	0.59–1.57
Psychiatric Medication	**0.19****	0.26	0.12–0.32
Number of Visits During Observation Period	0.97	0.03	0.92–1.03
NCs– High Functional Impairment (Class 6b)			
Gender	1.14	0.24	0.71–1.82
Age	**0.98***	0.01	0.97–1.00
Psychotherapy Received	0.86	0.26	0.51–1.43
Psychiatric Medication	1.28	0.31	0.70–2.33
Number of Visits During Observation Period	**1.09****	0.03	1.04–1.15

Note. Bolded and * $p < .05$; ** $p < .01$. Binary independent variables included: gender (female/male), psychotherapy received (yes/no), and psychiatric medication received (yes/no). Continuous independent variables included: age and number of visits during observation period.

Figure 11. Multinomial Logistic Regression for 6-Class Model: Parameter Estimates of Descriptive Predictor Variables with Reference Category SMDs– High Functional Impairment (Class 5b)



Note. Selected reference category was "SMDs– High Functional Impairment" (Class 5b) and * $p < .05$; ** $p < .01$.



Multinomial Logistic Regression Model 1: Reference Category 6b "Neurological Conditions–High Functional Impairment"

Reference category 6b "neurological conditions–high functional impairment" when compared to 1a "common mental disorders–none to low functional impairment" group and other variables in the model were held constant, the "common mental disorders–none to low functional

impairment" group were 2 times and more likely to be female (OR = 2.20; 95% CI= 1.23, 3.91; $p < .05$); much less likely to receive psychiatric medication (OR = 0.08; 95% CI= 0.04, 0.14; $p < .01$); attended fewer visits during the observation period (OR = 0.92; 95% CI= 0.86, 0.98; $p < .05$); age and psychotherapy received were not statistically significant *(see table 36, figure 12)*. Reference category 6b "neurological conditions–high functional impairment" when compared to 2a "severe mental disorders–none to low functional impairment" group and other variables in the model were held constant, the "severe mental disorders–none to low functional impairment" results showed no descriptive variables were significant. Reference category 6b "neurological conditions–high functional impairment" when compared to 3a "neurological conditions–none to low functional impairment" group and other variables in the model were held constant, the "neurological conditions–none to low functional impairment" results showed this subgroup was much less likely to receive psychotherapy (OR = 0.47; 95% CI= 0.28, 0.77; $p < .01$) and nearly 2.5 times and more likely to receive psychiatric medication (OR = 2.45; 95% CI= 1.02, 5.89; $p < .05$);. Descriptive variables such as gender, age, and the number of visits during observation period were not statistically significant. Reference category 6b "neurological conditions–high functional impairment" when compared to 4b "common mental disorders–high functional impairment" group and other variables in the model were held constant, the "common mental disorders–high functional impairment" results showed this subgroup was 2.5 times and much more likely to be female (OR = 2.55; 95% CI= 1.67, 3.89; $p < .01$) and about the same age (OR = 1.02; 95% CI= 1.00, 1.03; $p < .05$). In terms of treatment information, LCA class 4b was much less likely to receive psychiatric medication (OR = 0.15; 95% CI= 0.09, 0.24; $p < .01$), psychotherapy received

was not statistically significant, and there were fewer visits during the observation period (OR = 0.89; 95% CI= 0.85, 0.93; $p < .01$). Reference category 6b "neurological conditions–high functional impairment" when compared to 5b "severe mental disorders–high functional impairment" group and other variables in the model were held constant, the "severe mental disorders–high functional impairment" were about the same age (OR = 1.02; 95% CI= 1.00, 1.04; $p < .05$); had somewhat fewer visits during the observation period (OR = 0.92; 95% CI= 0.87, 0.97; $p < .01$); and other descriptive variables such as gender, psychotherapy received, and psychiatric medication received were not statistically significant. Based on model fitting information, there was significant improvement over the null model [X^2 (25, N= 914) = 373.25, p= < .01]. The Pearson's chi-square test indicated model fit [X^2 (4,410, N=914) =4,330.15, p=0.80] and also the deviance chi-square test indicated model fit [X^2 (4,410, N=914) =2,498.30, p=1.00].

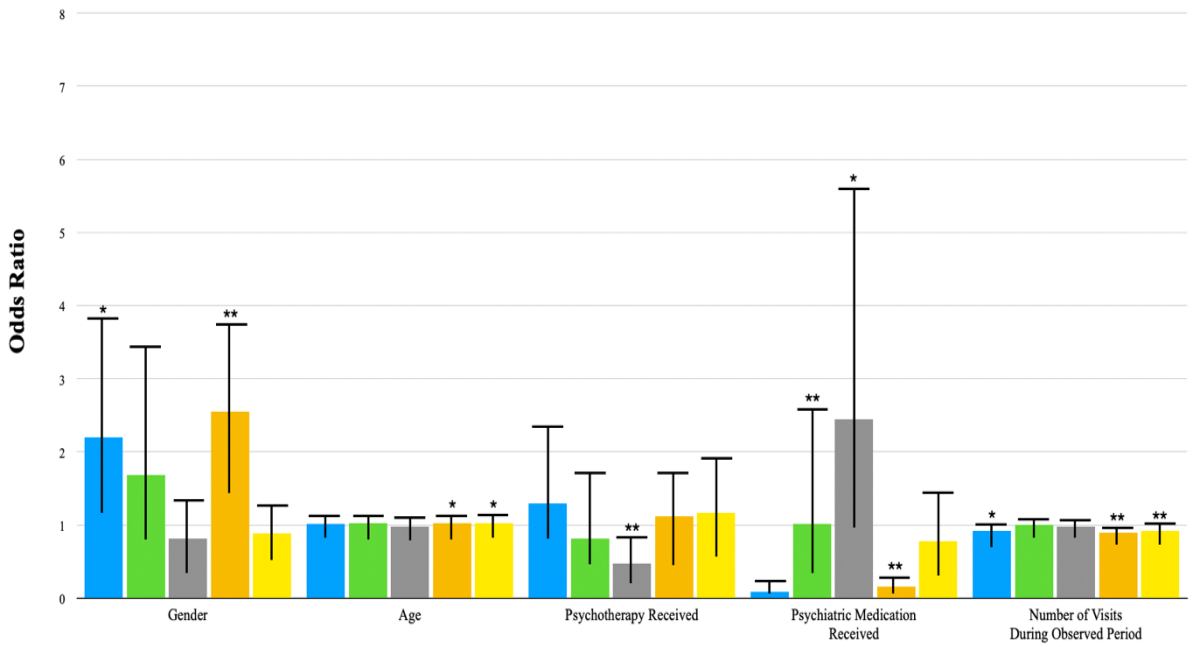
Table 36. Multinomial Logistic Regression for 6-Class Model: Parameter Estimates of Descriptive Predictor Variables with Reference Category NCs– High Functional Impairment (Class 6b)

Reference Category "NCs– High Functional Impairment" (Class 6b)	*Odds Ratio*	*Standard Error*	*95% Confidence Interval*
CMDs– None to Low Functional Impairment (Class 1a)			
Gender	**2.20***	0.30	1.23–3.91
Age	1.01	0.01	1.00–1.03
Psychotherapy Received	1.29	0.30	0.72–2.32
Psychiatric Medication	**0.08****	0.31	0.04–0.14
Number of Visits During Observation Period	**0.92***	0.03	0.86–0.98

Reference Category "NCs– High Functional Impairment" (Class 6b)	*Odds Ratio*	*Standard Error*	*95% Confidence Interval*
SMDs– None to Low Functional Impairment (Class 2a)			
Gender	1.68	0.36	0.84–3.38
Age	1.02	0.01	1.00–1.04
Psychotherapy Received	0.81	0.35	0.41–1.62
Psychiatric Medication	1.01	0.47	0.41–2.53
Number of Visits During Observation Period	1.00	0.03	0.93-1.05
NCs– None to Low Functional Impairment (Class 3a)			
Gender	0.81	0.25	0.50–1.33
Age	0.98	0.01	0.96–1.00
Psychotherapy Received	**0.47****	0.26	0.28–0.77
Psychiatric Medication	**2.45***	0.45	1.02–5.89
Number of Visits During Observation Period	0.98	0.02	0.94-1.03
CMDs– High Functional Impairment (Class 4b)			
Gender	**2.55****	0.22	1.67–3.89
Age	**1.02***	0.01	1.00–1.03
Psychotherapy Received	1.12	0.22	0.73–1.72
Psychiatric Medication	**0.15****	0.24	0.09–0.24
Number of Visits During Observation Period	**0.89****	0.02	0.85–0.93
SMDs– High Functional Impairment (Class 5b)			
Gender	0.88	0.24	0.55–1.41
Age	**1.02***	0.01	1.00–1.04
Psychotherapy Received	1.17	0.26	0.70–1.95
Psychiatric Medication	0.78	0.31	0.43–1.43
Number of Visits During Observation Period	**0.92****	0.03	0.87–0.97

Note. Bolded and * p <.05; ** p <.01. Binary independent variables included: gender (female/male), psychotherapy received (yes/no), and psychiatric medication received (yes/no). Continuous independent variables included: age and number of visits during observation period.

Figure 12. Multinomial Logistic Regression for 6-Class Model: Parameter Estimates of Descriptive Predictor Variables with Reference Category SMDs–High Functional Impairment (Class 6b)



Note. Selected reference category was "NCs– High Functional Impairment" (Class 6b) and * $p < .05$; ** $p < .01$.

Multinomial Logistic Regression Model 1 "None to Low Functional Impairment" and "High Functional Impairment"

LCA subgroups revealed two care pathways, and when we compare pathway one "none to low functional impairment" and pathway two "high functional impairment" the following

differences were observed. LCA subgroups 1a "common mental disorders–none to low functional impairment" were less likely to be on psychiatric medication when compared to 4b "common mental disorders–high functional impairment" (OR = 0.52; 95% CI= 0.32, 0.85; $p < .05$), and the other predictor variables such as gender, age, psychotherapy received, and number of visits during the observation period were not statistically significant. LCA subgroups 2a "severe mental disorders–none to low functional impairment" had a few more visits during the observation period when compared to 5b "severe mental disorders–high functional impairment" (OR = 1.08; 95% CI= 1.01, 1.16; $p < .05$), and the other predictor variables such as gender, age, psychotherapy received, and psychiatric medication received were not statistically significant. LCA subgroups 3a "neurological conditions–none to low functional impairment" received fewer psychotherapy sessions (OR = 0.47; 95% CI= 0.28, 0.77; $p < .01$) and were more likely to receive psychiatric medication (OR = 2.45; 95% CI= 1.02, 5.89; $p < .05$) when compared to 6b "neurological conditions–high functional impairment," and other predictor variables such as gender, age, and number of visits during the observation period were not statistically significant. Overall, the takeaways for clinicians would be that common mental disorders that have higher levels of functional impairment and will likely require psychiatric medication management. Severe mental disorders with none to low functional impairment may be willing to stay in treatment somewhat longer. Neurological conditions with none to low functional impairment were less likely to receive psychotherapy but did receive psychiatric medication more often. Potential reasons could be that patients were more likely to engage with psychiatric medication management vs. psychotherapy, or adherence was due to the availability of psychotherapy at the time the patient was seen at the

primary care clinic or hospital. The reasons patients who have neurological conditions with high functional impairment received psychiatric medication less often deserves further consideration.

Multinomial Logistic Regression Model 2: Clinical Symptom Predictor Variables

An unordered multinomial logistic regression was used to estimate correlates of clinical symptoms by mental health class. The model included the following independent variables: "clinically depressed," "functionally impaired," and "suicidal." The dependent variable was the categorical LCA class membership 1a–6b and the reference categories of "common mental disorders–none to low functional impairment," "severe mental disorders–none to low functional impairment," "neurological conditions–none to low functional impairment," "common mental disorders–high functional impairment," "severe mental disorders–high functional impairment," and "neurological conditions–high functional impairment" selected. The odds ratios (OR) were calculated, and the 95% confidence interval (CI) for each independent variable included, with significance value set to .05 (*). The goodness of fit was determined based on chi-square tests of Pearson's and deviance. There was no multicollinearity of independent variables and no violations of assumptions met. Sample characteristics of clinical symptom predictor variables within the LCA class were included for the unordered multinomial logistic regression model 2.

LCA class 1a the common mental disorders–none to low functional impairment subgroup (*n*=105) included patients that were subclinical for clinical depression (M=7.5, S.D.=6.53) and functional impairment (M=11.76, S.D.=1.83) scores, and rarely endorsed suicidality (*n*=1, 2.2%) *(see tables 37–38)*. LCA class 2a the severe mental disorders—none to low functional impairment subgroup (*n*=45) included patients that were somewhat clinically depressed (M=12.29, S.D.=6.78)

and almost functionally impaired (M=11.13, S.D.=2.18), but infrequently were suicidal (*n*=1, 1%). LCA class 3a the neurological conditions—none to low functional impairment subgroup (*n*=101) included patients that had low clinical depression scores (M=4.43, S.D.=5.4), and were almost functionally impaired (M=11.36, S.D.=1.95), but had more suicidality (*n*=15, 14.9%). LCA class 4b the common mental disorders—high functional impairment subgroup (*n*=353) included patients that were clinically depressed (M=19.64, S.D.=8.35), functionally impaired (M=21.74, S.D.=7.91), and occasionally were suicidal (*n*=10, 2.8%). LCA class 5b the severe mental disorders—high functional impairment subgroup (*n*=119) included patients that were again, clinically depressed (M=15.92, S.D.=10.12), functionally impaired (M=26.2, S.D.=9.97), and suicidal (*n*=14, 11.8%). The LCA class 6b neurological conditions—high functional impairment subgroup (*n*=191) had patients with subclinical depression (M=9.4, S.D.=7.03), but whom were functionally impaired (M=18.49, S.D.=6.46), and often suicidal (*n*=50, 26.2%). Overall, patients were less depressed, more functional, and rarely suicidal for LCA subgroups 1-3a, however, for LCA subgroups 4-6b clinical symptoms were much more severe. Differences between subgroups were compared in the multinomial logistic regression model 2.

Table 37. Clinical Symptom Predictor Variables within LCA Class 1–3a

	Class 1a (*n*=105)		Class 2a (*n*=45)		Class 3a (*n*=101)	
	n (%)	*M(SD)*	*n (%)*	*M(SD)*	*n (%)*	*M(SD)*
Clinically Depressed	n/a	7.6 (6.53)	n/a	12.29 (6.78)	n/a	4.43 (5.4)
Functional Disability	n/a	11.76 (1.83)	n/a	11.13 (2.18)	n/a	11.36 (1.95)
Suicidality	1 (2.2)	n/a	1 (1.0)	n/a	15 (14.9)	n/a

Table 38. Clinical Symptom Predictor Variables within LCA Class 4–6b

	Class 4b (*n*=353)		Class 5b (*n*=119)		Class 6b (*n*=191)	
	n (%)	*M(SD)*	*n (%)*	*M(SD)*	*n (%)*	*M(SD)*
Clinically Depressed	n/a	19.64 (8.35)	n/a	15.92 (10.12)	n/a	9.4 (7.03)
Functional Disability	n/a	21.74 (7.91)	n/a	26.2 (9.97)	n/a	18.49 (6.46)
Suicidality	10 (2.8)	n/a	14 (11.8)	n/a	50 (26.2)	n/a

Multinomial Logistic Regression Model 2: Reference Category 2a "Severe Mental Disorders–None to Low Functional Impairment"

Reference category 2a "severe mental disorders–none to low functional impairment" when compared to the 1a "common mental disorders–none to low functional impairment" subgroup and other variables in the model were held constant, the 1a "common mental disorders–none to low functional impairment" subgroup were somewhat more clinically depressed (OR = 1.10; 95% CI= 1.04, 1.17; $p < .01$), whereas functional impairment and suicidality were not statistically significant *(see table 39, figure 13).* Again, for reference category 2a "severe mental disorders–none to low functional impairment" when other variables in the model were held constant parameter estimates showed when compared to the 3a "neurological conditions–none to low functional impairment" subgroup, patients with "neurological conditions–none to low functional impairment" were much less likely clinically depressed (OR = 0.88; 95% CI= 0.82, 0.95; $p < .01$), less likely functionally impaired (OR = 0.76; 95% CI= 0.58, 1.00; $p < .01$), and

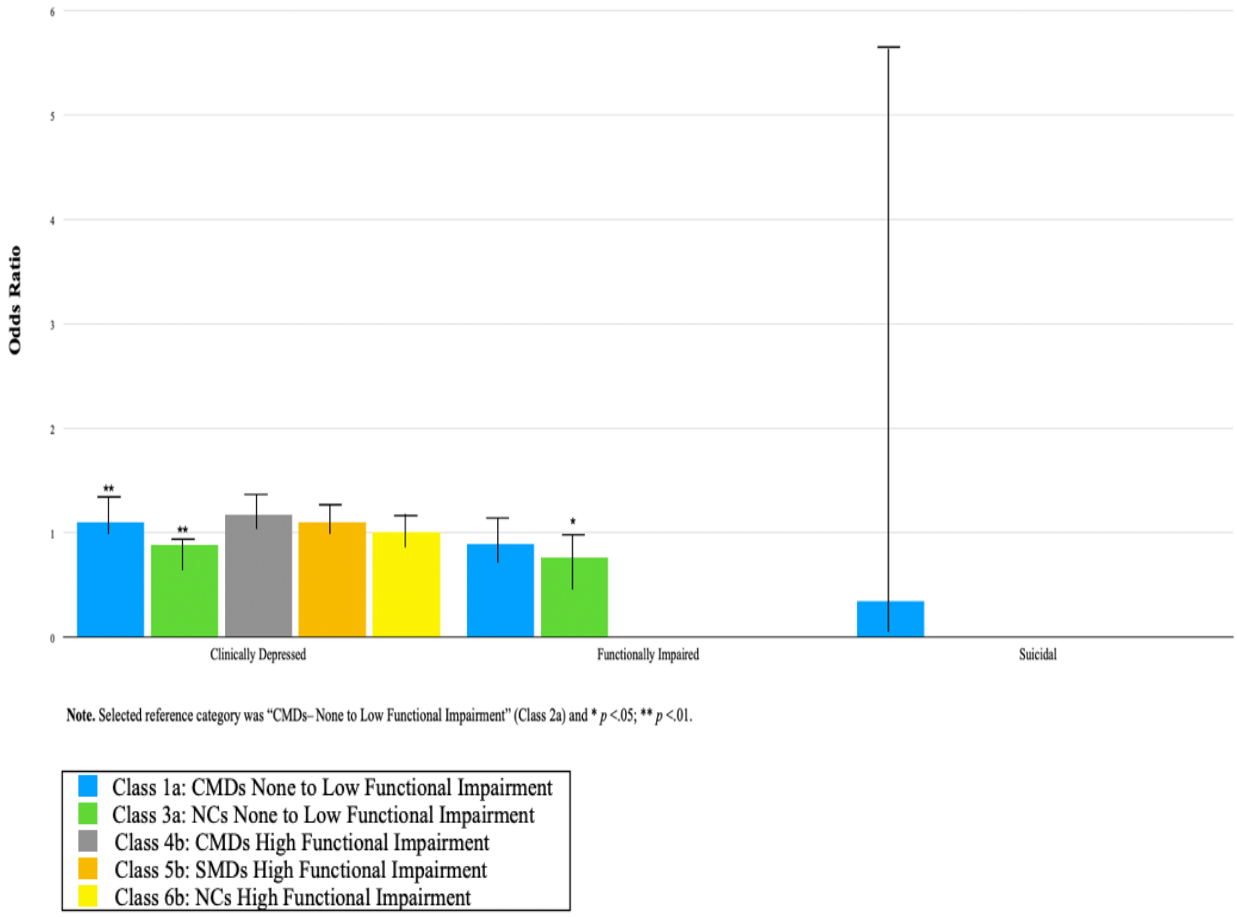
suicidality was not interpretable. For reference category 2a "severe mental disorders–none to low functional impairment" when other variables in the model were held constant parameter estimates showed when compared to 4b "common mental disorders–high functional impairment" subgroup, patients with "common mental disorders–high functional impairment" were more likely clinically depressed (OR = 1.17; 95% CI= 1.05, 1.29; $p < .01$), however, functional impairment and suicidality were not interpretable for this model. For reference category 2a "severe mental disorders–none to low functional impairment" when other variables in the model were held constant parameter estimates showed when compared to the 5b "severe mental disorders–high functional impairment" subgroup and 6b "neurological conditions–high functional impairment" subgroup clinical symptom variables were not statistically significant or interpretable. Based on model fitting information, there was significant improvement over the null model [X^2 (15, N= 914) = 657.99, p= < .01]. The Pearson's chi-square test indicated model fit [X^2 (1,325, N=914) =695.67, p=1.00] and also the deviance chi-square test indicated model fit [X^2 (1,325, N=914) =376.22, p=1.00].

Table 39. Multinomial Logistic Regression for 6-Class Model: Parameter Estimates of Clinical Symptom Predictor Variables for Reference Category SMDs– None to Low Functional Impairment (Class 2a)

Reference Category "SMDs– None to Low Functional Impairment" (Class 2a)	*Odds Ratio*	*Standard Error*	*95% Confidence Interval*
CMDs– None to Low Functional Impairment (Class 1a)			
Clinically Depressed	**1.10****	0.03	1.04–1.17
Functional Impairment	0.89	0.13	0.68–1.15
Suicidality	0.34	1.45	0.02–5.74
NCs– None to Low Functional Impairment (Class 3a)			
Clinically Depressed	**0.88****	0.04	0.82–0.95
Functional Impairment	**0.76***	0.14	0.58–1.00
Suicidality	n/a	n/a	n/a
CMDs– High Functional Impairment (Class 4b)			
Clinically Depressed	**1.17****	0.05	1.05–1.29
Functional Impairment	n/a	n/a	n/a
Suicidality	n/a	n/a	n/a
SMDs– High Functional Impairment (Class 5b)			
Clinically Depressed	1.10	0.05	1.00–1.21
Functional Impairment	n/a	n/a	n/a
Suicidality	n/a	n/a	n/a
NCs– High Functional Impairment (Class 6b)			
Clinically Depressed	1.00	0.05	0.91–1.11
Functional Impairment	n/a	n/a	n/a
Suicidality	n/a	n/a	n/a

Note. Bolded and * $p < .05$; ** $p < .01$. Continuous independent variables included: ZLDSI Depression Total Scores, WHODAS Functional Impairment Total Scores. Binary independent variables included: suicidality (yes/no).

Figure 13. Multinomial Logistic Regression for 6-Class Model: Clinical Predictor Variables with Reference Category SMDs–None to Low Functional Impairment (Class 2a)



Note. Selected reference category was "CMDs– None to Low Functional Impairment" (Class 2a) and * $p < .05$; ** $p < .01$.

Multinomial Logistic Regression Model 2: Reference Category 3a "Neurological Conditions–None to Low Functional Impairment"

Reference category 3a "neurological conditions–none to low functional impairment" when compared to the 1a "common mental disorders–none to low functional impairment" subgroup and other variables in the model were held constant, the "common mental disorders–

none to low functional impairment" subgroup were much more likely to be clinically depressed (OR = 1.25; 95% CI= 1.17, 1.33; $p < .01$) and much less likely suicidal (OR = 0.04; 95% CI= 0, 0.34; $p < .01$). Functional impairment was not statistically significant for this model *(see table 40, figure 14)*. Reference category 3a "neurological conditions–none to low functional impairment" when compared to 2a "severe mental disorders–none to low functional impairment" subgroup and other variables in the model were held constant, the "severe mental disorders–none to low functional impairment" patients were more likely depressed (OR = 1.13; 95% CI= 1.06, 1.22; $p < .01$) and more likely functionally impaired (OR = 1.32; 95% CI= 1.00, 1.72; $p < .05$), but were less likely suicidal (OR = 0.11; 95% CI= 0.01, 0.90; $p < .05$). Reference category 3a "neurological conditions–none to low functional impairment" when compared to 4b "common mental disorders–high functional impairment" subgroup and other variables in the model were held constant, the "common mental disorders–high functional impairment" revealed that patients were much more likely clinically depressed (OR = 1.32; 95% CI= 1.19, 1.47; $p < .01$), whereas functional impairment was not interpretable, and suicidality was not statistically significant. Reference category 3a "neurological conditions–none to low functional impairment" when compared to 5b "severe mental disorders–high functional impairment" subgroup and other variables in the model were held constant, the "severe mental disorders–high functional impairment" were much more likely clinically depressed (OR = 1.24; 95% CI= 1.12, 1.38; $p < .01$), again functional impairment was not interpretable and suicidality was not statistically significant. Reference category 3a "neurological conditions–none to low functional impairment" when compared to 6b "neurological conditions–high functional impairment" subgroup and other variables in the model were held

constant, the "neurological conditions–high functional impairment" subgroup were more likely to be clinically depressed (OR = 1.14; 95% CI= 1.03, 1.26; $p < .05$). Functional impairment and suicidality were not interpretable. Based on model fitting information, there was significant improvement over the null model [X^2 (15, N= 914) = 657.99, p= < .01]. The Pearson's chi-square test indicated model fit [X^2 (1,325, N=914) =695.67, p=1.00] and also the deviance chi-square test indicated model fit [X^2 (1,325, N=914) =376.22, p=1.00].

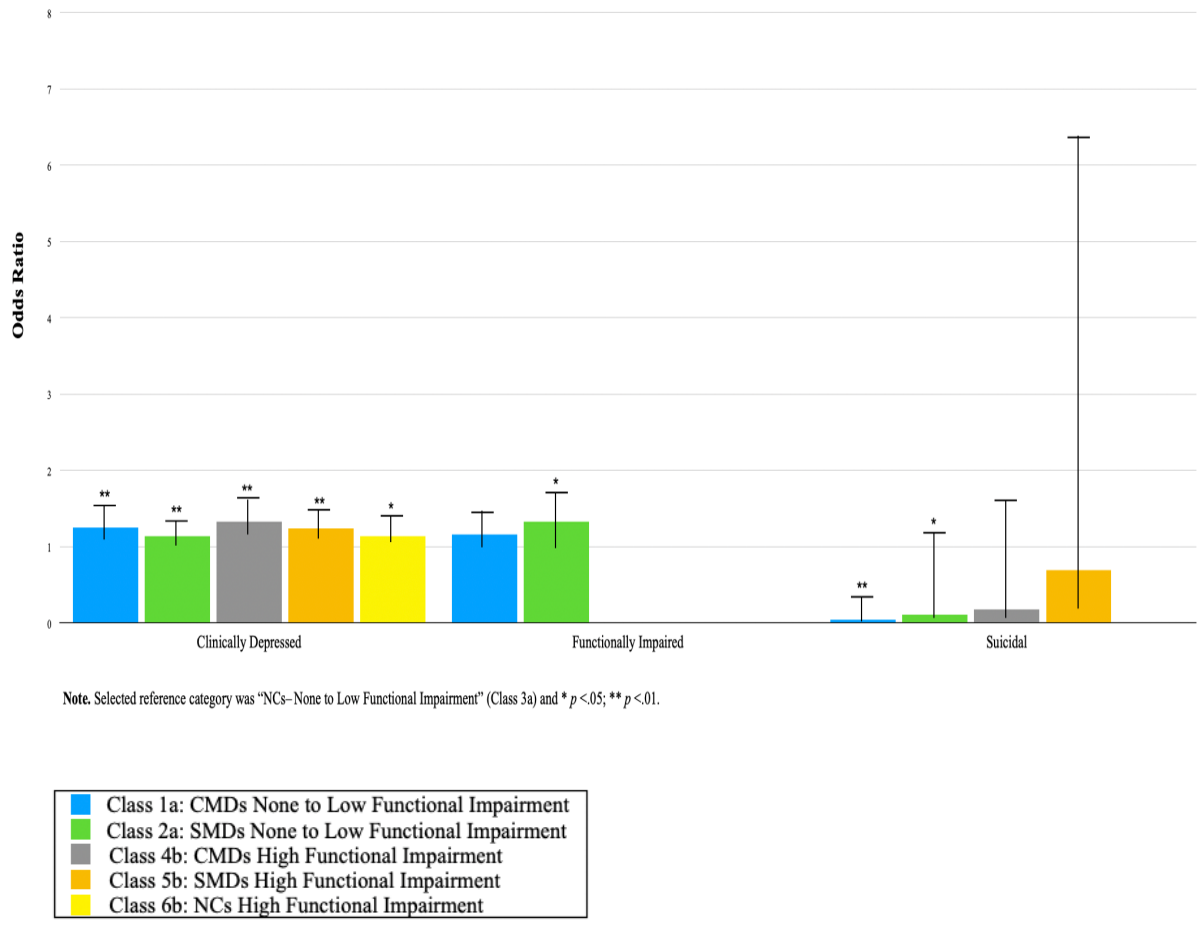
Table 40. Multinomial Logistic Regression for 6-Class Model: Clinical Predictor Variables with Reference Category NCs– None to Low Functional Impairment (Class 3a)

Reference Category "NCs– None to Low Functional Impairment" (Class 3a)	*Odds Ratio*	*Standard Error*	*95% Confidence Interval*
CMDs– None to Low Functional Impairment (Class 1a)			
Clinically Depressed	**1.25****	0.03	1.17–1.33
Functional Impairment	1.16	0.09	0.98–1.38
Suicidality	**0.04****	1.14	0–0.34
SMDs– None to Low Functional Impairment (Class 2a)			
Clinically Depressed	**1.13****	0.04	1.06–1.22
Functional Impairment	**1.32***	0.14	1.00–1.72
Suicidality	**0.11***	1.08	0.01–0.90
CMDs– High Functional Impairment (Class 4b)			
Clinically Depressed	**1.32****	0.05	1.19–1.47
Functional Impairment	n/a	n/a	n/a
Suicidality	0.17	1.13	0.02–1.60
SMDs– High Functional Impairment (Class 5b)			
Clinically Depressed	**1.24****	0.05	1.12–1.38
Functional Impairment	n/a	n/a	n/a
Suicidality	0.69	1.13	0.08–6.37

Reference Category "NCs– None to Low Functional Impairment" (Class 3a)	*Odds Ratio*	*Standard Error*	*95% Confidence Interval*
Clinically Depressed	**1.14***	0.05	1.03–1.26
Functional Impairment	n/a	n/a	n/a
Suicidality	n/a	n/a	n/a

Note. Bolded and * p <.05; ** p <.01. Continuous independent variables included: ZLDSI Depression Total Scores, WHODAS Functional Impairment Total Scores. Binary independent variables included: suicidality (yes/no).

Figure 14. Multinomial Logistic Regression for 6-Class Model: Clinical Predictor Variables with Reference Category NCs– None to Low Functional Impairment (Class 3a)



Note. Selected reference category was "NCs– None to Low Functional Impairment" (Class 3a) and * p <.05; ** p <.01.

Multinomial Logistic Regression Model 2: Reference Category 4b "Common Mental Disorders–High Functional Impairment"

Reference category 4b "common mental disorders–high functional impairment" when compared to the 1a "common mental disorders–none to low functional impairment" subgroup and other variables in the model were held constant, the "common mental disorders–none to low functional impairment" subgroup were much less likely to be functionally impaired (OR = 0; 95% CI= 0, 0.02; $p < .01$), and clinical symptom variables such as depression and suicidality were not statistically significant *(see table 41, figure 15)*. Reference category 4b "common mental disorders–high functional impairment" when compared to 2a "severe mental disorders–none to low functional impairment" group and other variables in the model were held constant, the "severe mental disorders–none to low functional impairment" revealed patients were much less likely clinically depressed (OR = 0.86; 95% CI= 0.78, 0.95; $p < .01$), and much less likely functionally impaired (OR = 0; 95% CI= 0, 0.02; $p < .01$), and suicidality was not statistically significant. Reference category 4b "common mental disorders–high functional impairment" when compared to 3a "neurological conditions–none to low functional impairment" subgroup and other variables in the model were held constant, the "neurological conditions–none to low functional impairment" revealed that no clinical symptoms were statistically significant and suicidality was not interpretable for this model. Reference category 4b "common mental disorders–high functional impairment" when compared to 5b "severe mental disorders–high functional impairment" subgroup and other variables in the model were held constant, the "severe mental disorders–high

functional impairment" subgroup were slightly less likely clinically depressed (OR = 0.94; 95% CI= 0.92, 0.96; $p < .01$), and somewhat more likely functionally impaired (OR = 1.07; 95% CI= 1.04, 1.10; $p < .01$). Notably, LCA class 5b was 4 times and much more likely to be suicidal (OR = 4.03; 95% CI= 1.68, 9.70; $p < .01$). Reference category 4b "common mental disorders–high functional impairment" when compared to 6b "neurological conditions–high functional impairment" subgroup and other variables in the model were held constant, the "neurological conditions–high functional impairment" subgroup were much less likely clinically depressed (OR = 0.86; 95% CI= 0.84, 0.89; $p < .01$), and somewhat less likely functionally impaired (OR = 0.97; 95% CI= 0.93, 1.00; $p < .05$). LCA class 6b, were nearly 12 times and much more likely to be suicidal (OR = 11.86; 95% CI= 5.42, 25.93; $p < .01$). Based on model fitting information, there was significant improvement over the null model [X^2 (15, N= 914) = 657.99, p= < .01]. The Pearson's chi-square test indicated model fit [X^2 (1,325, N=914) =695.67, p=1.00] and also the

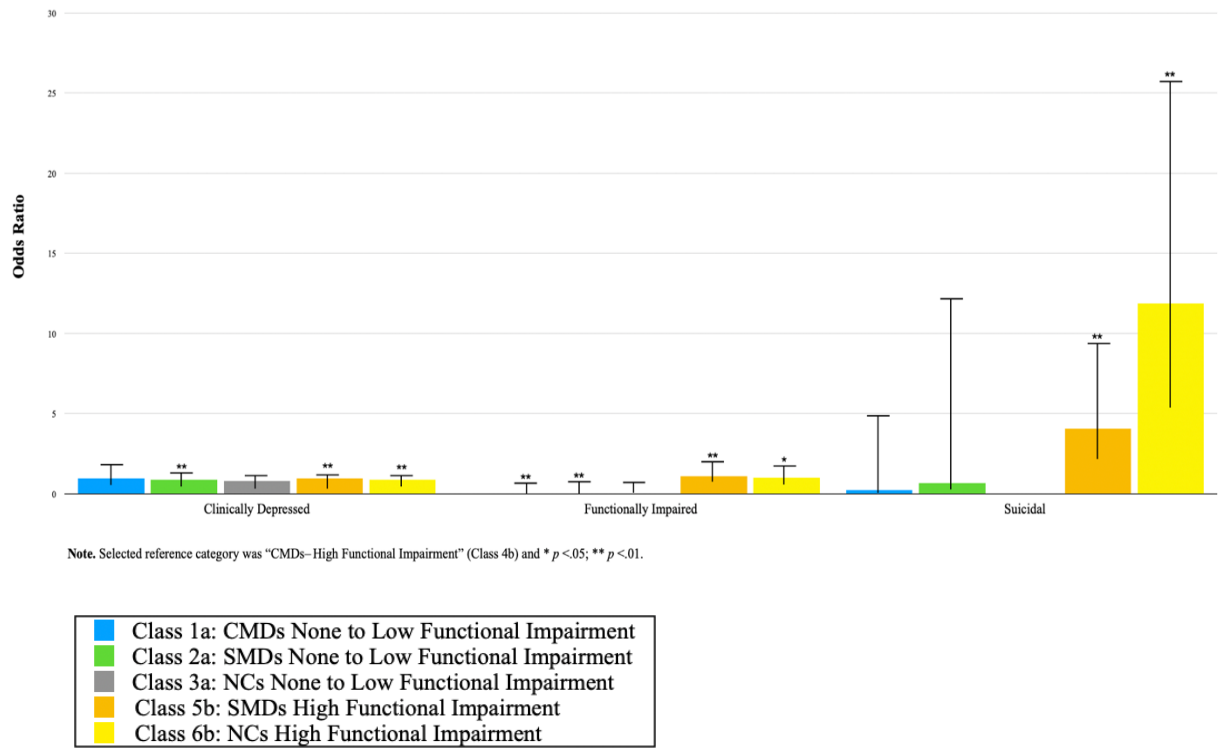
Table 41. Multinomial Logistic Regression for 6-Class Model: Clinical Predictor Variables with Reference Category CMDs–High Functional Impairment (Class 4b)

Reference Category "CMDs– High Functional Impairment" (Class 4b)	*Odds Ratio*	*Standard Error*	*95% Confidence Interval*
CMDs– None to Low Functional Impairment (Class 1a)			
Clinically Depressed	0.95	0.05	0.86–1.04
Functional Impairment	**0****	0.71	0–0.02
Suicidality	0.21	1.52	0.01–4.16
SMDs– None to Low Functional Impairment (Class 2a)			
Clinically Depressed	**0.86****	0.05	0.78–0.95
Functional Impairment	**0****	0.71	0–0.02
Suicidality	0.63	1.49	0.03–11.59

Reference Category "CMDs– High Functional Impairment" (Class 4b)	*Odds Ratio*	*Standard Error*	*95% Confidence Interval*
NCs– None to Low Functional Impairment (Class 3a)			
Clinically Depressed	0.76	0.05	0.68–0.84
Functional Impairment	0	0.71	0–0.01
Suicidality	n/a	n/a	n/a
SMDs–High Functional Impairment (Class 5b)			
Clinically Depressed	**0.94****	0.01	0.92–0.96
Functional Impairment	**1.07****	0.01	1.04–1.10
Suicidality	**4.03****	0.45	1.68–9.70
NCs–High Functional Impairment (Class 6b)			
Clinically Depressed	**0.86****	0.02	0.84–0.89
Functional Impairment	**0.97***	0.02	0.93–1.00
Suicidality	**11.86****	0.40	5.42–25.93

Note. Bolded and * p <.05; ** p <.01. Continuous independent variables included: ZLDSI Depression Total Scores, WHODAS Functional Impairment Total Scores. Binary independent variables included: suicidality (yes/no).

Figure 15. Multinomial Logistic Regression for 6-Class Model: Clinical Predictor Variables with Reference Category CMDs–High Functional Impairment (Class 4b)



Multinomial Logistic Regression Model 2: Reference Category 5b "Severe Mental Disorders–High Functional Impairment"

Reference category 5b "severe mental disorders–high functional impairment" when compared to 1a "common mental disorders–none to low functional impairment" subgroup and other variables in the model were held constant, the "common mental disorders–none to low functional impairment" subgroup were much less likely functionally impaired (OR = 0; 95% CI= 0, 0.01; p < .01) and were less likely suicidal (OR = 0.05; 95% CI= 0, 1.02; p < .05), and clinical depression was not statistically significant (*see table 42, figure 16*). Reference category 5b "severe mental disorders–high functional impairment" when compared to 2a "severe mental disorders–none to low functional impairment" group and other variables in the model were held constant, the "severe mental disorders–none to low functional impairment" patients were much less likely functionally impaired (OR = 0; 95% CI= 0, 0.02; $p < .01$) and other clinical symptoms were not statistically significant. Reference category 5b "severe mental disorders–high functional impairment" when compared to 3a "neurological conditions–none to low functional impairment" subgroup and other variables in the model were held constant, the "neurological conditions–none to low functional impairment" results showed patients were much less likely depressed (OR = 0.81; 95% CI= 0.73, 0.89; $p < .01$) and much less likely functionally impaired (OR = 0; 95% CI= 0, 0.01; $p < .01$). Reference category 5b "severe mental disorders–high functional impairment" when compared to 4b "common mental disorders–high functional impairment" subgroup and other variables in the model were held constant, the "common mental disorders–high functional impairment" results showed patients were somewhat more clinically depressed (OR = 1.07; 95%

CI= 1.03, 1.09; $p < .01$), much less functionally impaired (OR = 0.93; 95% CI= 0.91, 0.96; $p < .01$), and were much less likely to be suicidal (OR = 0.25; 95% CI= 0.10, 0.60; $p < .01$). Reference category 5b "severe mental disorders–high functional impairment" subgroup when compared to 6b "neurological conditions–high functional impairment" subgroup and other variables in the model were held constant, the "neurological conditions–high functional impairment" results showed patients were somewhat less clinically depressed (OR = 0.92; 95% CI= 0.89, 0.95; $p < .01$), somewhat less functionally impaired (OR = 0.90; 95% CI= 0.87, 0.93; $p < .01$), and nearly 3 times and much more likely to be suicidal (OR = 2.94; 95% CI= 1.43, 6.06; $p < .01$). Based on model fitting information, there was significant improvement over the null model [X^2 (15, N= 914) = 657.99, p= < .01]. The Pearson's chi-square test indicated model fit [X^2 (1,325, N=914) =695.67, p=1.00] and also the deviance chi-square test indicated model fit [X^2 (1,325, N=914) =376.22, p=1.00].

Table 42. Multinomial Logistic Regression for 6-Class Model: Clinical Symptom Predictor Variables with Reference Category SMDs–High Functional Impairment (Class 5b)

Reference Category "SMDs– High Functional Impairment" (Class 5b)	*Odds Ratio*	*Standard Error*	*95% Confidence Interval*
CMDs– None to Low Functional Impairment (Class 1a)			
Clinically Depressed	1.01	0.05	0.92–1.11
Functional Impairment	**0****	0.71	0–0.01
Suicidality	**0.05***	1.52	0–1.02
SMDs– None to Low Functional Impairment (Class 2a)			
Clinically Depressed	0.91	0.05	0.82–1.01
Functional Impairment	**0****	0.71	0–0.02
Suicidality	0.16	1.48	0.01–2.85

Reference Category "SMDs– High Functional Impairment" (Class 5b)	*Odds Ratio*	*Standard Error*	*95% Confidence Interval*
NCs– None to Low Functional Impairment (Class 3a)			
Clinically Depressed	**0.81****	0.05	0.73–0.89
Functional Impairment	**0****	0.71	0–0.01
Suicidality	1.44	1.13	0.16–13.28
CMDs– High Functional Impairment (Class 4b)			
Clinically Depressed	**1.07****	0.01	1.03–1.09
Functional Impairment	**0.93****	0.01	0.91–0.96
Suicidality	**0.25****	0.45	0.10–0.60
NCs– High Functional Impairment (Class 6b)			
Clinically Depressed	**0.92****	0.02	0.89–0.95
Functional Impairment	**0.90****	0.02	0.87–0.93
Suicidality	**2.94****	0.37	1.43–6.06

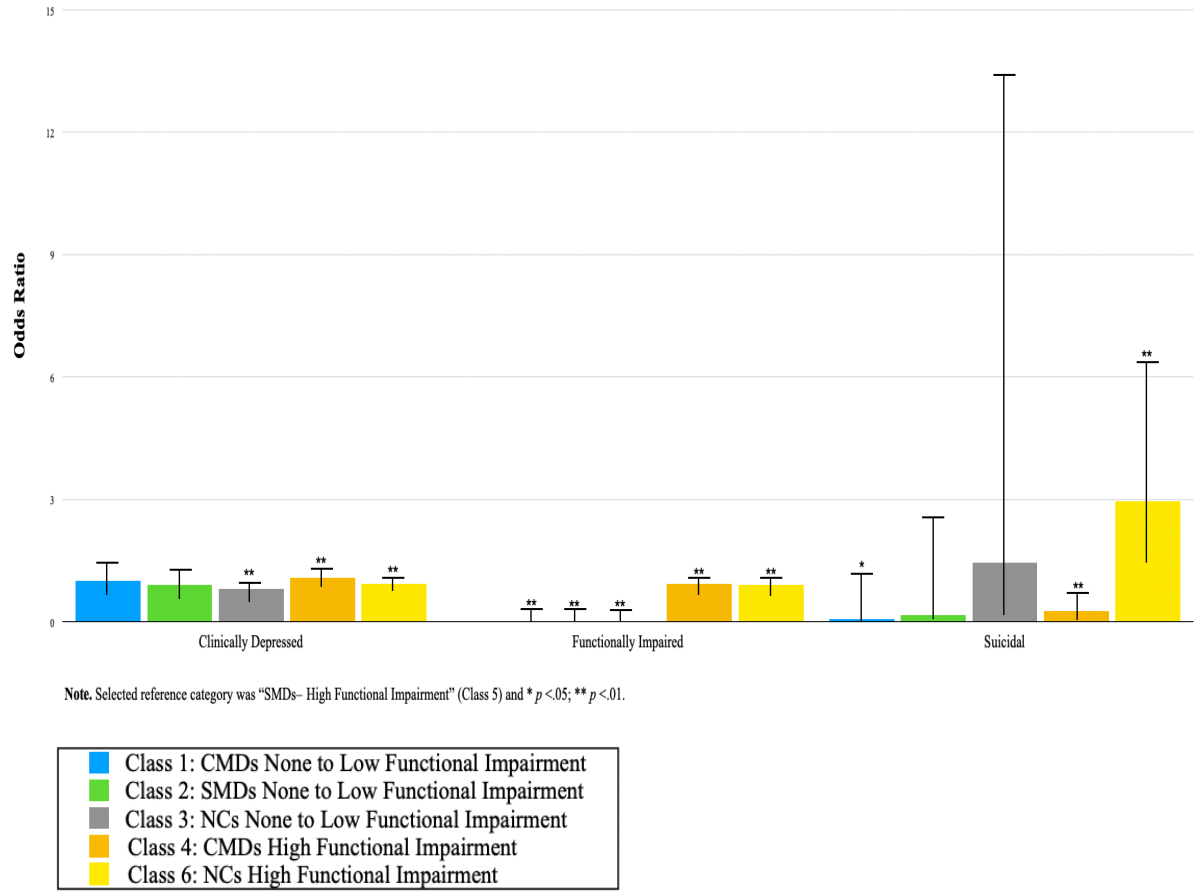
Note. Bolded and * $p < .05$; ** $p < .01$. Continuous independent variables included: ZLDSI Depression Total Scores, WHODAS Functional Impairment Total Scores. Binary independent variables included: suicidality (yes/no).

Multinomial Logistic Regression Model 2: Reference Category 6b "Neurological Conditions–High Functional Impairment"

Reference category 6b "neurological conditions–high functional impairment" when compared to 1a "common mental disorders–none to low functional impairment" subgroup and other variables in the model were held constant, the "common mental disorders–none to low functional impairment" subgroup were somewhat more clinically depressed (OR = 1.10; 95% CI= 1.00, 1.21; $p < .05$); much less functionally impaired (OR = 0; 95% CI= 0, 0.02; $p < .01$); and much less suicidal

(OR = 0.02; 95% CI= 0, 0.32; $p < .01$) *(see table 43, figure 17)*. Reference category 6b "neurological conditions–high functional impairment" when compared to 2a "severe mental disorders–none to low functional impairment" subgroup and other variables in the model were held constant, the "severe mental disorders–none to low functional impairment" results showed patients were much less likely functionally impaired (OR =0; 95% CI=0, 0.02; $p < .01$) and less likely suicidal (OR = 0.05; 95% CI= 0, 0.90; $p < .05$), whereas clinical depression was not statistically significant.

Figure 16. Multinomial Logistic Regression for 6-Class Model: Clinical Predictor Variables with Reference Category SMDs–High Functional Impairment (Class 5b)



Note. Selected reference category was "SMDs– High Functional Impairment" (Class 5) and * $p < .05$; ** $p < .01$.

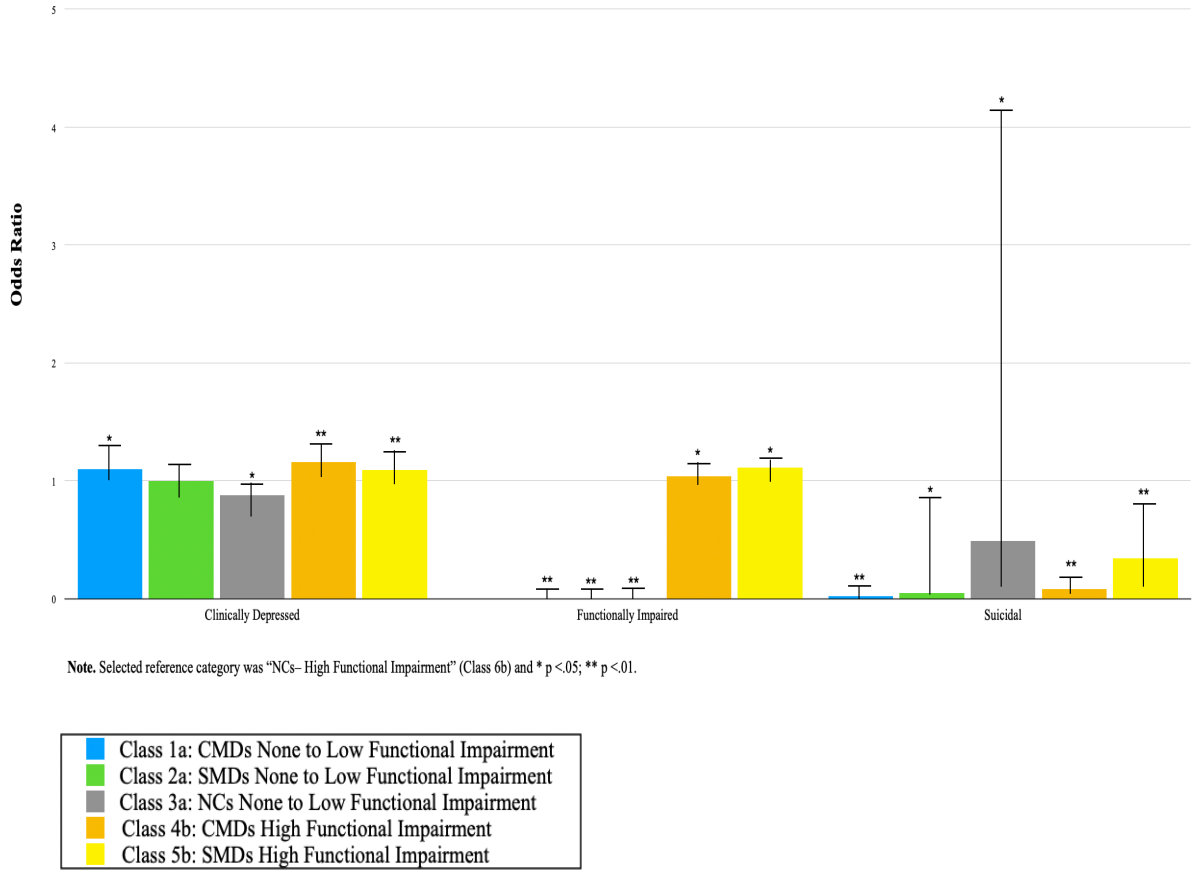
Reference category 6b "neurological conditions–high functional impairment" when compared to 3a "neurological conditions–none to low functional impairment" subgroup and other variables in the model were held constant, the "neurological conditions–none to low functional impairment" results showed this subgroup were less likely clinically depressed (OR = 0.88; 95% CI= 0.79, 0.97; $p < .05$) and much less likely functionally impaired (OR = 0; 95% CI= 0, 0.01; $p < .01$), and suicidality was not statistically significant. Reference category 6b "neurological conditions–high functional impairment" when compared to 4b "common mental disorders–high functional impairment" subgroup and other variables in the model were held constant, the "common mental disorders–high functional impairment" results showed this subgroup were somewhat more clinically depressed (OR = 1.16; 95% CI=1.13, 1.20; $p < .01$); somewhat more functionally impaired (OR = 1.04; 95% CI= 1.00, 1.07; $p < .05$); and were much less likely suicidal (OR = 0.08; 95% CI= 0.04, 0.18; $p < .01$). Reference category 6b "neurological conditions–high functional impairment" when compared to 5b "severe mental disorders–high functional impairment" subgroup and other variables in the model were held constant, the "severe mental disorders–high functional impairment" were again, somewhat more clinically depressed (OR = 1.09; 95% CI= 1.06, 1.13; $p < .01$); somewhat more functionally impaired (OR = 1.11; 95% CI= 1.07, 1.15; $p < .01$); and much less likely suicidal (OR = 0.34; 95% CI= 0.17, 0.70; $p < .01$). Based on model fitting information, there was significant improvement over the null model [X^2 (15, N= 914) = 657.99, p= < .01]. The Pearson's chi-square test indicated model fit [X^2 (1,325, N=914) =695.67, p=1.00] and also the deviance chi-square test indicated model fit [X^2 (1,325, N=914) =376.22, p=1.00].

Table 43. Multinomial Logistic Regression for 6-Class Model: Clinical Symptom Predictor Variables with Reference Category NCs–High Functional Impairment (Class 6b)

Reference Category "NCs– High Functional Impairment" (Class 6b)	*Odds Ratio*	*Standard Error*	*95% Confidence Interval*
CMDs– None to Low Functional Impairment (Class 1a)			
Clinically Depressed	**1.10***	0.05	1.00–1.21
Functional Impairment	**0****	0.71	0–0.02
Suicidality	**0.02****	1.48	0–0.32
SMDs– None to Low Functional Impairment (Class 2a)			
Clinically Depressed	1.00	0.05	0.90–1.10
Functional Impairment	**0****	0.71	0–0.02
Suicidality	**0.05***	1.45	0–0.90
NCs– None to Low Functional Impairment (Class 3a)			
Clinically Depressed	**0.88***	0.05	0.79–0.97
Functional Impairment	**0****	0.71	0–0.01
Suicidality	0.49	1.08	0.06–4.09
CMDs– High Functional Impairment (Class 4b)			
Clinically Depressed	**1.16****	0.02	1.13–1.20
Functional Impairment	**1.04***	0.02	1.00–1.07
Suicidality	**0.08****	0.40	0.04–0.18
SMDs– High Functional Impairment (Class 5b)			
Clinically Depressed	**1.09****	0.42	1.06–1.13
Functional Impairment	**1.11****	0.02	1.07–1.15
Suicidality	**0.34****	0.37	0.17–0.70

Note. Bolded and * $p < .05$; ** $p < .01$. Continuous independent variables included: ZLDSI Depression Total Scores, WHODAS Functional Impairment Total Scores. Binary independent variables included: suicidality (yes/no).

Figure 17. Multinomial Logistic Regression for 6-Class Model: Clinical Symptom Predictor Variables with Reference Category NCs–High Functional Impairment (Class 6b)



Note. Selected reference category was "NCs– High Functional Impairment" (Class 6b) and * p <.05; ** p <.01.

Multinomial Logistic Regression Model 2 "None to Low Functional Impairment" and "High Functional Impairment"

LCA subgroups revealed two care pathways, and when we compare pathway one "none to low functional impairment" and pathway two "high functional impairment" the following differences were observed. LCA subgroups 1a "common mental disorders–none to low functional impairment" were much less likely functionally impaired when compared to 4b "common mental disorders–high functional impairment" (OR = 0; 95% CI= 0, 0.02; $p < .01$), and other predictor

variables such as clinically depressed and suicidality were not statisticallly significant. LCA subgroups 2a "severe mental disorders–none to low functional impairment" were much less likely functionally impaired when compared to 5b "severe mental disorders–high functional impairment" (OR = 0; 95% CI= 0, 0.01; p < .01), and other predictor variables such as clinically depressed and suicidality were not statistically significant. LCA subgroups 3a "neurological conditions–none to low functional impairment" were less likely clinically depressed (OR = 0.88; 95% CI= 0.79, 0.97; $p < .05$) and were much less likely functionally impaired (OR = 0; 95% CI= 0, 0.01; $p < .01$) when compared to 6b "neurological conditions–high functional impairment" and suicidality was not statistically significant. Therefore, LCA subgroup 3a represents a clinically less severe neurological conditions subgroup. Altogether, the main finding for clinicians when we compare the severity of clinical symptoms such as depression, suicidality, and functional impairment has shown that the most defining clinical feature for patients was functional impairment.

Chapter Seven: Discussion

Key Results Summary

The present study explored characteristics of unknown mental health patterns in Haiti. Following the 2010 earthquake a mental health infrastructure was established in a post-disaster setting where formalized services were not readily available. Findings provide key insights into current mental health priorities, the mental health infrastructure and pathways to care, and set out implications for clinical practice. Specifically, the results reinforce current PIH and ZL practices that mental health treatment has been beneficial to patients. A latent class analysis allowed us to identify clinical needs without previous assumptions, because the data clusters patients based on known indicators of mental disorders such as the patient's diagnosis, mood symptoms like depression and suicidality, and functional impairment into clinical subgroups. A 6-class model revealed the importance of mental health treatment for common mental disorders, severe mental disorders, and neurological conditions. The best fitting model showed that there were two clinical pathways defined by the primary diagnosis indicator category, functional impairment, and the severity of mood symptoms.

Implications from the study results will be useful to inform current mental health practices and unify task-sharing model frameworks. A strength to the present task-sharing model was the movement beyond common mental disorders, to further include severe mental disorders and neurological conditions. Additionally, the presented LCA model includes psychiatric medication management, which has been shown to be a high clinical priority in LMICs (Rathod, et al., 2017).

While there have been barriers to mental health treatment implementation PIH and ZL demonstrate the ability to identify and amend presented challenges at the macro and micro level. It ensures the delivery of quality clinical services in a global mental health setting. Rebuilding healthcare, and establishing the mental healthcare infrastructure has since provided a definitive example of overcoming barriers on a large-scale. A second example, at the micro level has been to identify when there were no available screening tools for depression that reflected the local culture. PIH and ZL then developed and validated the ZLDSI to provide an accurate measure of depression symptoms. Taken together, the results provide data-driven support that the established mental health infrastructure has been feasible, accessible, and had high levels of treatment engagement. Future research on the mental health infrastructure from PIH and ZL may offer guidelines for global mental health researchers to establish standards of care.

Mental Health Priorities

The data-driven results present key priorities for mental health in Haiti. In terms of the case identification, patient referral, and diagnosis the following considerations are provided. Case identification occurs at present with clinicians and community providers through care pathways. After patients are triaged based on the ZLDSI screening tool for depression, clinical observation, and expert oversight from supervisors determine the appropriate level of care. Minimal information was included on case identification prior to the patient's arrival to the hospital or clinic. Patient referrals however, typically included community providers, clinical staff, other medical personnel, and traditional healers. High–volume treatment utilization areas were Hôpital Cange and Hôpital Universitaire de Mirebalais, and as longstanding local providers may have

increased trust within the community. Psychologists delivered the majority of psychosocial interventions (83.04%), and of the total sample 67.1% of patients received psychosocial services. For psychiatric medication delivery there were very few medical doctors available. Medical doctors (generalists) delivered .6% of psychiatric services, and medical doctors alongside psychologists 11.27% of psychiatric services. The treatment coverage however, for the total number of patients whom received psychiatric medication management was high (60.3%). Therefore, results suggest, that while psychiatric medication delivery was high that the direct access to a medical doctor (generalist) was low. Further, the mental health treatment engagement with the nursing and social work teams was also very low (less than 1%). For all practitioners it is likely the patient caseload is incredibly high and increases the potential for provider burnout. ZL expert clinicians explained that coordination with nursing has been minimal and that nurses likely due to program budgets are not assigned to mental health service delivery on a full-time basis. ZL clinicians described that access to even one full-time nurse for mental health would be incredibly useful to increase psychiatric medication delivery. Along these lines, it is evident there is a high need for medical doctors (generalists), including those with a specialization in psychiatry, and again how this will configure into current program budgets should be addressed at the NGO level. Visits during the observation period ranged from 1-3 however, it was unclear whether this was due to attrition or clinical improvement. ZL expert clinicians described a major barrier to ongoing mental health treatment is transportation, and that previously clinical treatment that had better attendance had provided patients with travel vouchers and offered a meal. At the management and oversight level, increasing collaborative care, assessing clinical outcomes longitudinally, and

better understanding the barriers to ongoing mental health treatment for patients might improve current provider skill package delivery.

Nevertheless, the data suggest there was high treatment engagement across mental disorders. The most frequent primary diagnosis included (1) major depressive disorder (60.3%) and generalized anxiety disorder (27.2%) for common mental disorders, (2) psychotic spectrum disorders (47.6%) and bipolar disorder (23.7%) for severe mental disorders, and (3) epilepsy (88.8%) for neurological conditions. Patients were infrequently diagnosed with co-occurring psychological disorders [common mental disorders (12.6%), severe mental disorders (0.03%), neurological conditions (0.04%)]. Common mental disorders were 2–3 times more likely to be female, which is consistent with previous literature (Kessler, 2003; National Collaborating Centre for Mental Health, 2011). As one might anticipate, common mental disorders most often received psychosocial interventions, whereas more often severe mental disorders and neurological conditions received pharmacological treatment. While common mental disorder subgroups frequently received psychosocial interventions [class 1a "common mental disorders–none to low functional impairment" (75.2%)], when we examine more severe clinical subgroups the number of patients who received psychosocial interventions were actually comparable [class 4b "common mental disorders –high functional impairment" (70.6%)]. For example, psychosocial interventions were still regularly received by severe mental disorders [class 2a "severe mental disorders–none to low functional impairment" (60%); class 5b "severe mental disorders–high functional impairment" (70.6%)] and neurological conditions [class 3a "neurological conditions–none to low functional impairment" (44.6%); class 6b "neurological conditions –high functional impairment"

(62.8%)]. Priority medications included anticonvulsants, antidepressants, antipsychotics, and anxiolytics. Patients were frequently prescribed Amitriptyline and Fluoxetine for common mental disorders, Risperidone for severe mental disorders, and Carbamazepine for neurological conditions. Anxiolytics were rarely prescribed for common mental disorders, severe mental disorders, or neurological conditions. In terms of other clinical needs, the current treatment targets of depressed mood, suicidality, and functional impairment were reinforced by the high rates observed in the total study sample. Increased needs exist for neurological conditions, in particular epilepsy and findings are consistent with previous research that shows an increased prevalence of epilepsy in Haiti (Collaborators, G. B. D. E., 2019). Moreover, neurological conditions, that were comprised diagnostically of epilepsy were shown to be at especially high-risk for suicidality. Severe mental disorders compared to common mental disorders revealed that the severe mental disorders subgroup also was at high-risk and 4 times as likely to be suicidal. Below how these results fit into the current Haitian mental health infrastructure, and suggestions for clinical practice are described.

Mental Health Infrastructure

Electronic Health Records. A major benefit to the present study was the use of electronic health records. In the global research literature dissemination studies do not always implement such data systems however, the present study strengthens the argument that EHR within primary care would be valuable. LMICs are often the categorization for low-resource settings, however, EHR provides the advantage of big data that can be used for epidemiological and public health research that would offer information about how to individualize treatment. Further, EHR

produces clinical targets to ensure quality oversight in a more infrastructure specific, and country specific way. For example, the finding that epilepsy may be more prevalent for Haitians would not be readily identified by research that relies on more general categorizations of LMICs. Another example, includes present mental health treatment barriers to psychiatric medication management has likely been due to minimal collaboration with nursing, but is a result that would not generalize to all LMICs. At one point, the term LMICs was perhaps necessary in order to understand healthcare priorities globally but mental health infrastructure that includes EHR as part of the dissemination process again allows for individualized care, quality oversight, and ensures that there will be a country specific assessment.

At present, PIH and ZL offer a model for EHR data that includes crucial information on (1) basic demographics such as age, gender (2) referral source (3) provider type (4) delivered treatment location (5) primary and secondary diagnosis with semi-structured and standardized protocols (6) list of current and past psychiatric medications (7) list of psychosocial interventions received (8) measure of mood symptoms with a validated screening tool for depression such as the ZLDSI (9) ZL suicidality screening instrument as needed when indicated with a positive response on ZLDSI item-12 (10) assesses homicidal ideation (11) evaluates seizures (12) measure of functional impairment with the WHODAS and (13) measure of clinical severity (CGI-S) and improvement (CGI-I) with the Clinical Global Impression. EHR data therefore has provided an efficient way to capture patient data and since the mental health infrastructure has been built and established, has offered the opportunity to assess clinical needs and determine how to improve clinical services. Based on the results of the present study it would be recommended to amend the

EHR with the following: (A) requirement that each clinical measure is scored before the clinician can proceed in the patient chart, (B) while clinically assessed to separate in the EHR current variables for suicidal and homicidal ideation, intent, and past attempt as they have implications for risk level (C) include patient flags when suicidal or homicidal intent and previous attempt history are documented in the patient chart with a prompt for the current ZL safety plan, and (D) EHR will prompt the clinician for suicide assessment at each appointment until the patients suicidality improves.

Patient triage is determined by care pathways and procedures for risk level are already established however, the addition of patient flags in the EHR will inform clinicians how best to proceed with use of the database. Patient flags are an alert or pop-up within an EHR system to convey to the clinical provider next steps for clinical care, alert supervisors, and track high-risk patients for ongoing monitoring and follow-up. Patient flags will allow for increased accuracy in terms of patient care pathways and increase efficiency for high-volume clinic and hospital settings. At present, the EHR is completed by data managers rather than in real-time. Initially, the EHR was designed to be completed by the clinician while the patient was present at the appointment however, there were limitations based on computer access and data programming. In the future, computer access and data programming would be a realistic barrier to address as the direct input into the system would increase accuracy and ensure proper clinical documentation. Additional resources would need to be allocated to guarantee the continued development of EHR, and while providing training on how to use the EHR system for documentation and efficient clinical treatment planning.

To better understand the nature of clinical services EHR data collection may provide further detail about case finding (E) to describe how the patient initially was connected with mental health services (F) to ask if this was the patient's first visit to the hospital or clinic (G) whether the patient accepted mental health services (H) and if the response was "non" or "no" to describe the reason why. Details like this will improve efforts with case finding, and for internal use allow the hospital and clinic management oversight to evaluate potential barriers to mental health treatment access. Provided that mental health problems are often comorbid with medical conditions a list of current and past medical conditions, and family medical history while collected information at the ZL intake, when added to the EHR will provide valuable and holistic information about other patient needs (e.g., HIV, tuberculosis). Along these lines, since high rates of functional impairment were observed it would be useful to include information about if the patient has (I) caregiver support for their illness and (J) the caregivers contact information. The ZL team already integrates family, caregivers, and community into the mental health treatment service delivery but these questions in EHR would further formalize into currently implemented procedures.

Additionally, (K) asking about the importance of spirituality and religion for the patient will be clinically useful. The research suggests, spiritually informed mental health treatment is meaningful and helpful for Haitians (Auguste & Rasmussen, 2019; Blanc, et al., 2016). Questions about interest in spiritually informed mental health treatment can inform clinicians to integrate such perspectives into the current care pathways with the use of mental health tools. Other demographics that might be included and, line up with Sustainable Development Goals (SDG)

would measure patient (D) food access (E) housing stability (F) literacy (G) to add with current occupation patient's work status (employed, seeking work, unemployed) (J) interpersonal and sexual violence (past or current) (K) transportation access for healthcare appointments (L) rural vs. urban resident (M) clean water access and (N) electricity access. Again, since there were high rates of depressed mood symptoms and functional impairment understanding the patient's social context would be important as it its likely interrelated. Importantly, demographic questions based on SDGs allow clinicians to further assess the difficult reality many Haitians have to face to inform treatment planning. It connects the bridge between mental health and SDGs. Additional data may solidify future partnerships with NGOs and government agencies that utilize mental health treatment to target SDGs.

To summarize, EHR data from the present study has been beneficial for internal use, offers information to improve the quality of clinical care, and has increased utility for research purposes. The use of EHR addresses a main critique of task-sharing models about the lack of clarity regarding quality clinical service delivery (Hoeft, et al., 2018). There has been emerging evidence that task-sharing models are effective (Singla, et al., 2016) for low resource settings. However, prior to the evaluation of service quality, more task–sharing models first must be implemented. The clinical quality assessments are often evaluated by clinical outcomes and too often there are a lack of even the initial screening tools available to low resource settings. The current EHR system allows for the evaluation of long-term mental health treatment efficacy at–scale with the use of standardized screening tools, and demonstrates a viable solution to ensure quality oversight.

Mental Health Care Pathways. Results indicate the task-sharing model followed the mental healthcare pathways developed by PIH and ZL. This suggests, the established mental health infrastructure has been adhered to by clinical providers and was accepted by patients. It provides a unique model of mental healthcare, as it includes severe mental disorders and neurological conditions with psychiatric medication management. Most collaborative care or task-sharing models to date, have targeted common mental disorders with psychosocial interventions (Singla, et al., 2016). Since common mental disorders represent the largest group of individuals who experience and seek treatment for mental disorders when compared to the lower population prevalence of severe mental disorders or neurological conditions, common mental disorders were a high priority to address as part of the mhGAP. At this point however, the task-sharing model must expand to include patients with severe mental disorders and neurological conditions and based on present findings are at increased risk for suicide and require pharmacological care.

The primary psychosocial intervention delivered with the current task-sharing model was IPT. The World Health Organization recommends IPT as a first-line treatment for depression, that appears to be feasible and acceptable more broadly as a mental healthcare option for common mental disorders, severe mental disorders, and neurological conditions, and works well in conjunction with psychiatric medication management. A transdiagnostic approach with IPT for depression symptoms addresses a concern in previous global research literature that current treatment options for LMICs have had too much diagnostic specificity, where scalable and sustainable mental health services are necessary (Conway, Hammen, & Brennan, 2012; Murray, et al., 2014; Ulbricht, et al., 2018). Along these lines, a major benefit to the present study has

demonstrated a task-sharing model can readily expand to severe mental disorders and neurological conditions as part of a single mental health infrastructure, and provided transdiagnostic psychosocial interventions such as IPT and other common elements approaches.

The majority of patients diagnosed with epilepsy are living with a treatable neurological condition, and the same potential to manage symptoms has been observed for psychotic disorders and bipolar disorder (Meyer, et al., 2010; Rathod, et al., 2017). To not deliver mental healthcare evokes unnecessary suffering and limits individual economic contribution to the community (McKnight & Kashdan, 2009; Whiteford, et al., 2013). By ignoring mental disorders, it only exacerbates societal and economic problems. For example, there is increased cost when seeking treatment later or when not managing psychological symptoms at all there are likely secondary impacts. Secondary impacts include the potential violation of human rights by denying mental health care or long-term confinement, unnecessary interactions with law enforcement, encounters with the criminal justice systems, and employment issues. In other words, it is an unnecessary burden economically and to societal sectors when there are evident options for mental health treatment that would allow people to thrive. Globally the reason mental health treatment is key, is that it allows citizens to fully participate in society and builds stronger ties to the community. Overall, these results give foundational evidence that care pathways offer a functional system for mental healthcare service delivery within a post-disaster setting.

Mental Health Tools Expansion. The PIH and ZL frontline healthcare team use a standardized manual for the task-sharing model and care pathways "Tools for Use in an Integrated, Community-Based Mental Health System of Care: An Introduction and Reference Guide." The

manual provides detailed guidelines for triage and mental health tools for depression, psychotic disorders, and epilepsy (*see figures 3-5*). While not an aspect of the present study there are guidelines for child and adolescent mental health. Other clinical care pathways that have been developed include a post-traumatic stress disorder pathway with Cognitive Processing Therapy (CPT) as the delivered treatment modality and alcohol use disorder pathway. In the present study, the rates of alcohol use disorder and PTSD were very low. After the 2010 earthquake nearly all Haitians including children endorsed some symptoms of PTSD (Cerdá, at al., 2013; Cénat, & Derivois, 2014; Cénat, et al., 2018), although for many people PTSD improved 30-months following the earthquake (25.98%) (Cénat & Derivois, 2014) and our results reflect that clinical improvement.

The manual "Tools for Use in an Integrated, Community-Based Mental Health System of Care: An Introduction and Reference Guide" provides valuable training materials that offer mental health tools by section. Each patient receives a semi-structured and standardized clinical intake interview, screening tools are specific to the mental disorder such as the ZLDSI or Abnormal Involuntary Movement Scale (AIMS) and examination procedures that inform triage to the appropriate level of clinical care (low intensity vs. high intensity), clinical symptom checklists, differential diagnosis, referral and follow-up forms. In terms of clinical treatment, there are procedures that consist of psychoeducation cards, medication evaluation forms, clinical treatment guidelines, stigma assessments, recommendations for family, caregiver, and community involvement, and when risk is indicated offers safety plans. Additionally, there are protocols for relapse prevention strategies and ongoing clinical outcome measurement. Some additions

recommended for this already utilized and useful manual based on the latent class analysis results and multinomial logistic regression models include the following for mental health skill packages.

(1) Primary Diagnosis Indicator Categories. The LCA indicators naturally fell into clinical subgroups of common mental disorders (100%), severe mental disorders (100%), and neurological conditions (100%), with two distinct care pathways that were defined by the primary diagnosis categorization, severity of mood symptoms, level of functional impairment, and suicidality *(see table 17)*. A benefit to the present care pathways that despite specificity to depression, psychotic disorders, and epilepsy the patients with other mental disorders (e.g., generalized anxiety disorder, bipolar disorder) were not excluded from mental health service delivery *(see tables 18–29)*. This increases the generalizability of results that patients were not excluded based on the primary diagnosis, psychiatric comorbidity, severity of depressed mood symptoms, or severity of functional impairment.

(2) Depressed Mood Symptoms. Again, another definitive indicator of the LCA model was the severity of depressed mood symptoms. The present study compared to previous LCA models on depression suggests depression severity often determines clinical depression subgroups (Ulbricht, et al., 2018). Results suggest, common mental disorders (100%), severe mental disorders (100%), and neurological conditions (100%) each have two clinical pathways *(figures 6–7)*. Pathway one included three classes: class 1a "common mental disorders–none to low functional impairment" (45%), class 2a "severe mental disorders–none to low functional impairment" (27%), and class 3a "neurological conditions–none to low functional impairment" (11%) where percentages represent the "low" probability of depressed mood symptoms. Pathway two included

the other remaining three classes: class 4b “common mental disorders–high functional impairment” (77%), class 5b “severe mental disorders–high functional impairment” (60%), and class 6b “neurological conditions–high functional impairment” (25%) where percentages represent the “low to high” probability of depressed mood symptoms. Depressed mood symptoms were evaluated with the ZLDSI, and ZL expert clinicians described regular utilization of this particular screening tool that had been locally adapted and validated. The LCA results therefore, support the ZLDSI as an appropriate measurement tool for depressed mood symptoms to inform patient triage and to determine care pathways.

(3) Functional Impairment. Interestingly, the most definitive LCA model clinical indicator was functional impairment, even more so than depressed mood symptoms. This follows the recommendation of previous LCA model literature to evaluate functional impairment especially in the context of depression (Ulbricht, et al., 2018). As previously described, there were two clinical pathways each for common mental disorders (100%), severe mental disorders (100%), and neurological conditions (100%). In addition to depressed mood symptoms, functional impairment based on severity aligned with the same two clinical pathways. Pathway one included three classes: class 1a “common mental disorders–none to low functional impairment” (0), class 2a “severe mental disorders–none to low functional impairment” (19%), class 3a “neurological conditions–none to low functional impairment” (0) where percentages represent a “none to low” probability of functional impairment. Pathway two included the other remaining three classes: 4b common mental disorders (100%), 5b severe mental disorders (100%), and 6b neurological conditions (100%) where percentages represent the “high” probability of functional impairment.

While the WHODAS was coded with a simple scoring method (Andrews, et al., 2004), based on the total scores results offer a crude measure of functional impairment. In other words, the WHODAS for this particular scoring method was not specific to a domain of functioning such as cognition, mobility, self-care, getting along with others, life activities, and participation. Nevertheless, findings showed that patients self-reported to clinical providers that functional impairment was frequently a problem and burdensome.

Functional impairment will potentially be useful to determine care pathways. For example, patient's with psychotic symptoms or epilepsy may not endorse moderate to severe depressed mood symptoms despite high levels of functional impairment. High functional impairment along with other psychological distress would not necessarily be captured by measurement of depressed mood symptoms only, and consequently such patients with the ZLDSI screening tool have the potential to be referred for lower levels of care instead of collaborative care that would include high intensity treatment such as psychosocial interventions and psychiatric medication management. Specifically, patients in the psychotic disorder or epilepsy care pathways, with the inclusion of functional impairment as a screening tool at the initial intake will expand the mental health service coverage. For example, the most severe clinical LCA subgroups that would require high intensity treatment through collaborative care were class 4b "common mental disorders–high functional impairment," class 5b "severe mental disorders–high functional impairment," and class 6b "neurological conditions–high functional impairment" with "low to high" depressed mood symptoms and "high" functional impairment. Looking at this more closely, LCA class 4b common mental disorders with high functional impairment (100%) actually had the highest probability of

depression (77%). By comparison class 5b severe mental disorders with high functional impairment (100%) and class 6b neurological conditions with high functional impairment (100%) had fewer depressed mood symptoms (class 5b severe mental disorders=60% depressed mood; class 6b neurological conditions= 25% depressed mood). Based on the depressed mood symptoms only, patients who do not readily express the experience of seizures or psychotic symptoms would have a high likelihood of being screened to receive low intensity services, without the necessary high intensity services that would include psychiatric medication management. That said, class 5b severe mental disorders with high functional impairment and class 6b neurological conditions with high functional impairment, evidently are in major psychological distress but would potentially be screened out of collaborative care referrals. Based on the primary diagnosis for these subgroups that frequently included psychotic disorder, bipolar disorder, and epilepsy, high levels of functional impairment, and suicidality scores that were elevated with probabilities that ranged from 12-26%—these subgroups require higher levels of care. One could argue, that patients based on the primary diagnosis would already be referred for psychiatric medication management however, including functional impairment would decrease the likelihood of clinical oversight. Nevertheless, of the total sample, 50% of patients endorsed moderate to severe depression symptoms and nearly 75% endorsed functional impairment. Consequently, mental health service coverage with the addition of functional impairment as an initial screening tool will likely improve mental health service coverage for collaborative care by almost 25%. The measurement of mood and functional impairment aligns with WHO mental health treatment recommendations.

(4) Suicidality and Epilepsy. Interestingly, the suicide indicator in the LCA model was the highest for neurological conditions: Class 3a neurological conditions with "none to low functional impairment" (15%) and class 6b neurological conditions with "high functional impairment" (26%). More specifically, patients had a primary diagnosis of epilepsy (class 3a neurological conditions=93% epilepsy and class 6b neurological conditions=87.4% epilepsy). As previously described, the ZLDSI for depression has been a highly beneficial screening tool for patient triage that determines care pathways. That said, the ZLDSI item-12, which assesses suicidality at triage may be especially important for neurological conditions. For example, class 3a neurological conditions with "none to low functional impairment" had an 11% probability of depressed mood symptoms, but the probability of suicidality increased to 15%. We can infer therefore, that 4% of patients with neurological conditions may experience suicidality without depressed mood symptoms. Similarly, more severe neurological conditions like class 6b with "high functional impairment" had a 25% probability of depressed mood symptoms and 26% probability of suicidality. Again, potentially 1% of patients with more severe neurological conditions had experienced suicidality without depressed mood symptoms.

Reasons for this finding may be known side effects of suicidal ideation to Tegretol (Carbamazepine) a main psychiatric medication treatment for epilepsy, as the symptom scores may not have been from the patients first visit. Alternatively, morphological changes in the brain due to neurological symptoms like seizures may have led to disinhibition and mood dysregulation, thus increased the likelihood of suicidality that would not necessarily include endorsement of moderate to severe depressed mood symptoms. For example, patients with epilepsy in high-income samples

have been shown to be at increased risk for suicide by 5 times and 25 times greater when there are complex partial seizures of temporal lobe origin (Kanner, 2006). Clinicians on the frontline mental healthcare team at ZL also described that patients with epilepsy present with the most severe psychological distress, which likely has been exacerbated in the context of social stigma given seizures are locally believed to be due to a hex or voodoo curse. After patients begin pharmacological treatment the clinicians at ZL stated many of the depressed mood symptoms and suicidality subside, and future research longitudinally can evaluate such clinical outcomes.

(5) Suicidality–CMDs and SMDs. According to the LCA model common mental disorders rarely experienced suicidality (1-3%), and the primary diagnosis consisted of major depression, mild to moderate episode (50.4%) and generalized anxiety disorder (35.2%). As one might anticipate, class 5b severe mental disorders with high functional impairment were at elevated risk for suicide (12%). The primary diagnosis was usually psychotic disorder (57.8%) and bipolar disorder (17.8%). It should be noted that severe mental disorders included major depression with severe symptoms, which provides an explanation for the reduced suicidality of the common mental disorder's subgroups. Overall, suicidality was present for each LCA subgroup (1a to 6b) with probabilities that ranged from 1-26%, or put another way 6 out 6 LCA subgroups. Implications of this finding emphasize the importance of initial and ongoing suicidality assessment for all mental disorders, especially neurological conditions and severe mental disorders that have elevated risk-levels.

(6) Mental Health Tools for Bipolar Disorder. Based on the data new mental health tools for the current manual were identified. First, mental health tools specific to bipolar disorder

(23.7%) would be applicable to this population with consideration to the primary diagnosis rates. Such mental health tools for bipolar disorder might include, screening tools like the Young Mania Rating Scale (YMRS), with more specific information on hypomania vs. mania, and treatment guidelines that include psychoeducation and Lithium treatment. A challenge with including this psychiatric medication in the current treatment model is the potential for Lithium side effects like other psychotropic medications but also toxicity, and therefore require continued Lithium level monitoring with monthly blood samples. The majority of patients complete 1-3 visits, and such a commitment from the patient to receive Lithium would require assessment at the initial visit and local availability of the psychiatric medication. Clinical trials have shown that Lithium as a monotherapy in fact out performs other psychiatric medications such as Valproate, Olanzapine, or Risperidone and provides an effective low-cost treatment (Malhi, et al., 2013). Lastly, Family Focused Therapy (FFT) approaches and relapse prevent strategies for bipolar disorder are recommended to expand within the current ZL guidelines. FFT and relapse prevention interventions would be applicable to psychotic disorders, and the child and adolescent care pathway as well.

(7) Mental Health Tools for Generalized Anxiety Disorder. Second, the data suggests that mental health tools specific to generalized anxiety disorder (27.2%) would also be useful. Again, this would build upon the current model with mental health tools that include a symptom checklist, differential diagnosis with PTSD, treatment guidelines such as relaxation strategies and CBT skills for intrusive thoughts, and medication management recommendations for patients with severe symptoms.

(8) Mental Health Tools for Women. Third, mental health tools specific to women and family planning would be highly valuable. The majority of patients who sought mental health services were women (66.7%), and based on the MLR model 1common mental disorders were 2–3 times more likely female. This could be due to many reasons, that include increased violence toward women, power differentials within society, economic disparities, birth and childcare responsibilities, and perhaps a gender bias to pathologize women's symptoms with consideration to common mental disorders globally (World Health Organization, 2013). Due to factors such as environmental, systemic, and household trauma that is often directed specifically toward Haitian women, and routinely culturally normalized there is often increased psychological distress provided the hostile and violent social context (Verdeli, et al., 2016). Based on what we currently know, common mental disorders have primarily impacted women but conclusions as to why are challenging to draw upon. It raises the question, are women truly impacted more by common mental disorders or are sociocultural factors increasing psychological distress? While likely it is both, the reasons why common mental disorders like depression are much higher for women deserves more evaluation. Based on these results, the current care pathways might also include more women–centered training materials and mental health tools on topics such as interpersonal and sexual violence, post-partum and menopause related depression, perinatal psychosis, and perinatal bipolar disorder. To summarize, clinical implementation would include mental health programming for bipolar disorder, generalized anxiety disorder, women's mental health, functional impairment scale development and targeted psychosocial interventions, and increased

suicide prevention strategies for epilepsy and severe mental disorders, and the expansion of psychiatric medication management within collaborative care.

Clinical Implications of Functional Impairment

Functional impairment as a main treatment outcome measure may be less stigmatizing for some patients to describe and provides a way for community mental healthcare providers to screen for distress with minimal clinical training and to deliver psychosocial interventions that target behavioral change related to functional impairment outcomes. It may be possible, that individuals benefit from brief psychosocial interventions that are 4–6 visits to target functional impairment. Goal setting and behavioral activation already has been implemented by PIH and ZL. Further, ZL clinicians described goal setting and behavioral activation as useful and shown observed benefit to patients. Building upon these mental health tools goal setting for functional impairment targets would include A) self-care: independently dressing, combing hair, brushing teeth, bathing, eating, and staying alone B) mobility: developing a standing and walking routine, utilizing transportation C) cognition: listening to the radio, singing a new song, or drawing a map of directions to improve concentration and learning D) getting along with others: meeting new people, practicing communication skills with a therapist E) life activities: support from family members to breakdown into steps household chores, therapy to practice communication skills, seeking work, education, or volunteer experience F) participation: engagement in the community or religious rituals.

IPT importantly targets depression in four domains related to functional impairment that include 1) role transitions, 2) grief and loss, 3) interpersonal disputes, and 4) the development of

interpersonal social skills (Lewandowski, et al., 2016; Verdeli, 2016). IPT breaks the social isolation, gives hope, and allows the patient to develop interpersonal skills to reduce stressors that when within a global context often includes exposure to aggression, hostility, and violence. The addition of brief psychosocial interventions for functional impairment will allow clinicians to target the basics for the patient first. Addressing functional impairment directly, potentially will improve quality of life and increase treatment engagement with other mental health services. Alternatively, if mood and functional impairment symptoms remit with brief psychosocial interventions, it is a cost-effective and time efficient approach to reduce the global disease burden. Community mental health providers could offer brief counseling within the IPT framework. Brief psychosocial interventions that emphasizes skill-building could target functional impairment and may be useful as a pre-treatment approach. If a patient has severe symptoms, they would still be able to receive psychiatric medication and it would likely begin to reach the therapeutic dose (6 weeks after pre-treatment) and increase readiness for individual or group therapy (e.g., IPT, CBT, CPT) that will target psychological symptoms. Again, functional impairment with additional research may be useful as an indicator to inform who receives high intensity vs. low intensity treatments, and who will recover.

Implementation

Haitian's are resilient given ongoing stressors that include the currently high unemployment rates, food insecurity, minimal education access, escalating political unrest that has led to road closures and power outages, and such dire circumstances have worsened with the COVID-19 global pandemic. While the data from this study was collected from 2016-2018, the

current impact on psychological well-being due to COVID-19 has devastated this income restricted setting. The number of COVID-19 cases and total death toll for Haitians while low has further resulted in severe food insecurity and job scarcity. The majority of Haitians while young are experiencing malnourishment and chronic psychological distress. Civil unrest and political corruption have been followed by more kidnappings for ransom that live on desperate and vulnerable families. Gang violence has increased and kidnappings are directed toward school children, lawmakers, hospital staff, and foreign aid workers. A vaccine delivery under these extreme conditions will offer some relief, but without systemic change, medication refrigeration, equitable access in the supply chain, food availability, and willingness to receive the vaccine there will be minimal light at the end of a long road. As we reflect on this moment globally this may be later viewed as another moral failure.

That said, sustainability with current mental health services therefore are of the utmost importance and while data-driven results provide key insights, it still raises questions about implementation under such circumstances of major chronic distress and overburdened systems. Nevertheless, PIH and ZL persist to deliver quality mental healthcare and even amidst the growing civil unrest. Provided the global circumstances and assessment of current needs, mental healthcare is essential and again can be connected further to SDGs. It is recommended travel vouchers, meals, and job or education support be offered in primary care alongside mental health services, and will potentially provide a safe place for community. Based on the data it is important to integrate nursing further into psychiatric medication delivery provided the high level of need for severe mental disorders and neurological conditions. The high patient case-loads are evident for the

psychologists, nurses, and medical doctors (generalists), which increases the potential for clinical provider burnout. Undoubtedly, nurses especially may be overwhelmed clinically and thereby decreases the likelihood of mental health service engagement. However, without integration with nursing or new additional providers it increases patient care responsibilities at excess for medical doctors (generalists). It may be useful in future research to assess reasons why nursing engagement in mental health services has been low to generate new solutions. For example, what are nurses individual views on mental health, assessment of current caseload and clinical burnout, mental health training needs, and to evaluate from the nurses' perspective on reasons for/against increased collaborative mental healthcare. Again, at the systems level it may be due to the limited ability to assign a nurse manager full-time to mental health service delivery. Perhaps mental health seminars and didactics generally can build more of a training and collaborative care alliance between healthcare teams.

Alternatively, other collaborators such as NGOs or government healthcare agencies may be willing to supervise and deliver additional psychiatric medication training. Considerations were also raised by mental health clinicians at ZL about utilization of the WHODAS as a main measure of functional impairment. Clinicians described patients may not fully understand questions from the WHODAS, and unlike the ZLDSI this measure was not locally adapted and validated. Nevertheless, the WHODAS is a measure utilized often in global settings, and the present study findings offers a crude measure to indicate high vs. low functional impairment. This feedback from ZL clinicians provides an opportunity to expand the validation of functional impairment screening tools. For example, the WHODAS with future research may be locally validated and adapted to

reflect problems presented by Haitian patients. A benefit of continuing to use the WHODAS measure would be to compare future data longitudinally. Another possibility, would be to implement the Sheehan Disability Scale (SDS), an efficient measure to administer with 3-items about functional impairment. The SDS assesses three domains of functioning such as 1) work/school, 2) social life/leisure activities, and 3) family life/home responsibilities on a scale of 0 (not at all) to 10 (extremely) with total scores that range from 0 (no functional impairment) to 30 (high functional impairment). Adaption of the SDS measure will need to reflect that community or spiritual rituals are potentially more applicable rather than "leisure activities." Moreover, "seeking work or education" may be another adaptation because of the currently high unemployment rates and limited education access. The CGI while not locally adapted or validated, has been described by ZL clinicians as clinically useful and due to the brevity has been applicable in a high-volume setting. The CGI captures the patient's severity of illness over the past 7 days (CGI-S), and afterward the patient's clinical improvement following treatment (CGI-I) and when applicable includes assessment of side effects to psychiatric medication management based on the clinician's observation. Functional impairment is important to assess separately from the CGI-I and CGI-S, as the proposed functional impairment measure would be based on the patient's self-report rather than clinician's observed rating, and the clinical global impression measures a separate construct. The CGI-I was not included in the present study as it did not evaluate clinical treatment outcomes. To summarize, current practices that assess depressed mood symptoms, suicidality, and functional impairment have demonstrated benefits to patient care.

Standards of Care

In global mental health a unified framework for best practices or standards of care does not exist (Hook & Vera, 2020). The manuscript by Raviola and colleagues (2020) provide details on the development of a comprehensive, and community–based mental healthcare system. While the results from the present study are preliminary, findings provide further support that the Haitian mental healthcare system has been feasible and acceptable for good clinical practice. The task-sharing model framework suggests this is an inclusive mental healthcare system for common mental disorders, severe mental disorders, and neurological conditions that may be useful to other low resource settings. Electronic health records allowed for data-driven assessment to ensure quality clinical services that provide information to tailor and individualize patient mental health treatment while providing country specific, and infrastructure specific information. ZL expert clinicians discussed increased coordination and procedures for risk mitigation between clinicians and supervisors. Along these lines, ZL expert clinicians described clinical issues that have led to significant loss due to a lack of resources. Specifically, a lack of psychiatric medication availability within the supply chain has had deleterious consequences. One clinical example included a 17-year-old child who had been stabilized with Carbamazepine (Tegretol) and shown good compliance, and regularly participated in psychosocial mental health services. Upon return to the hospital to refill her psychiatric medication the patient and clinicians learned Carbamazepine (Tegretol) was no longer available. After, she had a major seizure and fell to the ground hitting her head on a rock, and due to the impact of the fall she passed away. The clinical vignette connects the importance of EHRs and incident documentation to identify such high-risk patients sooner but

also to alert on a supervisor-level and systemic–level when psychiatric medication supplies are low. Standardized procedures for psychiatric medication inventories are essential to reduce psychiatric medication shortages, and with increased clinical oversight from supervisors and hospital management teams can procure the necessary psychiatric medications through expedited deliveries that are shipped from abroad. Clinicians and hospitals provide life-saving psychiatric medications for free to patients, and without this option available patients are unable to afford or access their psychiatric medications. Of note, clinicians currently provide patients with one month to two-month psychiatric medication supplies. For patients managing seizures, mania, psychosis, or major depression with suicidality including clinical procedures to require at least a two-month back–up supply would be recommended in case of emergency shortages, unforeseen delivery delays, shifts or new supplier relationships, reduced production and delivery volume that may occur especially in the context of COVID. These factors are of increased importance for a country like Haiti where a Caribbean location and frequent natural disasters such as hurricanes are not uncommon and delivery access is mostly possible only through air or maritime routes. Another back-up option during psychiatric medication shortages on–site at the clinic or hospital might include increased coordination between primary care clinics and hospitals with the local pharmacies and Haitian Ministry of Health. For example, the primary care clinic or hospital would provide the patient with a paid voucher to receive the essential psychiatric medication(s) for free at the local pharmacy. At the same time, it is unnecessary to have such supply chain issues arise unexpectedly and the appropriate response would require increased notification of inventory shortages at an earlier stage. Therefore, simply put one cannot ignore such major clinical

consequences that have already arisen even within a functional community–based mental health system. Such incident reporting demonstrates accountability and will allow for the implementation of increased quality oversight to mitigate future patient and provider risk. By addressing these problems directly, it advocates on behalf of the patient and reduces stress for the clinician that such a devastating instance will occur in the future, and reduces overall liability and risk at the clinician level, primary care clinic and hospital level, and NGO level.

In addition, to risk-management procedures it is recommended that increased clinical monitoring include a weekly report that would be sent out to the clinical supervisory teams that indicate patient risk-level. Patient risk-level can be assessed and incident reports would be required under the following circumstances: (1) endorsement of suicidal or homicidal plan and/or intent, or past history of a suicide attempt (2) self-harm attempts (3) injury toward others, including staff (4) violent or aggressive behavior toward self or staff (5) hostile/violent or unauthorized family members, partners, caregivers (6) restraint of patient (7) sexual harassment, intimidation, or assault toward others (8) damage to property or theft (9) on-site alcohol or substance related intoxication of the patient or clinician (10) psychiatric medication errors or major clinical issues (11) severe medical reactions to medication (12) acute psychosis, mania, or seizures (13) child and adolescent abuse (14) elderly abuse (15) patient experiences domestic assault, interpersonal violence, or sexual assault (16) severely disabled patients and (17) complaints/allegations with staff or others. Along with risk-assessment and incident reports, patients that endorse or meet criterion that match these circumstances would subsequently require ongoing monitoring to assess clinical improvement and to guarantee access to mental health services. Patients under these

categorizations may benefit from flexibility with clinicians to have more frequent sessions (e.g., twice per week with phone calls until the patient has been stabilized), paid vouchers for travel with a meal for clinical appointments, paid vouchers for psychiatric medication at the local pharmacy, maintain psychiatric medication back-up supply (at least two-months), increased psychoeducation and coordination with family or caregivers, relapse prevention, and when applicable the continued assessment of safety planning. Moreover, when staff is involved there would be formal procedures to make certain that the situation has reached a resolution. To implement, there could be designated risk-managers to oversee these procedures for clinical adherence with supervisors and clinical teams, weekly reports that track incident reports completed at the clinician level, supervisory level, ZL clinic and hospital systemic level, and PIH NGO systemic level, to determine if the necessary equipment and supplies are available, document staff related injuries, and document fatalities that might include suicide, homicide, overdose, primary care clinic or hospital negligence, or severe adverse reactions to medication. Following death-related incident reports it would be appropriate to have a meeting with the ZL clinical teams, ZL supervisors, ZL clinic and hospital management, and PIH NGO directors to discuss how to improve the quality of clinical services to reduce future risk. Oversight and accountability, are of the utmost importance to confirm similar incidents do not occur in the future and to further support clinical staff by identifying needs and offering additional training as necessary. Importantly, this also verifies that with ongoing documentation and accountability that the potential for legal representation as required and human rights abuses toward vulnerable patients and staff are minimized, mitigated, and responded to ethically should such an instance arise. Documentation on-site at the time of the incident report would include the

account of the patient and clinician. Ideally, risk-management oversight would include representatives from PIH, ZL, and an outside organization to offer perspectives that are well-rounded, balanced, and provide a framework for implementation of an ethical response and solution.

Other key priorities for implementation in Haiti include mental health tools expansion for epilepsy and bipolar disorder, women's focused mental health treatment such as family planning, post-partum depression, interpersonal violence and sexual assault response, increased suicide prevention strategies, and emphasize the importance to clinically address functional impairment. Currently, the ZL team has been developing programming for psychosocial rehabilitation, that aligns with ZL clinical observation and results from the present study that functional impairment has been a debilitating problem for Haitians. That said, depressed mood symptoms and functional impairment in the future may be useful as a main screening tool for patient triage. Patients who indicate some level of functional impairment could receive pre-treatment or low intensity brief psychosocial interventions, which would address the basics of functioning and potentially increase the likelihood of future treatment response when mood symptoms are targeted. The study while preliminary suggests that these clinical indicators are worth considering within a task-sharing model. Therefore, the present study provides evidence that supports clinical outcome measures for depression symptoms, suicidality, and functional impairment are essential. In terms of mental health service delivery low-intensity and high-intensity mental health services with psychiatric medication management were accepted by clinicians and patients for common mental disorders, severe mental disorders, and neurological conditions. The continuation of ongoing clinical

services, efficacy, and relapse prevention strategies deserve additional consideration from an evaluative standpoint.

When examining data from the present study, the results identify necessary competencies, and highlight areas to strengthen clinical training and allocate more resources within the current community-based mental health system. Overall, the present community-based mental healthcare system infrastructure has been supported by large-scale data and demonstrates mental health services are necessary to provide on behalf of the citizens whom reside in Haiti. Additionally, the study suggests that the present task-sharing model with the established care pathways has been highly beneficial. The level of collaboration, and positive action have allowed current stakeholders to provide a sustainable mental healthcare model. Data suggests that clinical providers offer good mental health service coverage for patients with common mental disorders, severe mental disorders, and neurological conditions but are overextended in terms of expansion. Future growth and development therefore will require increased funding sources and partnerships with NGOs and governmental agencies.

Limitations

Cross-Sectional Design

Cross-sectional design limits our interpretation because it includes a single datum time point. Moreover, while observation at a single time point may reveal a relationship between variables, the causality will be challenging to determine. It would be useful for future research to include longitudinal data points, and especially with consideration to mental health subgroups to assess clinical outcomes.

Self-Report Measures

With self-report there is always the potential for error and recall bias. For example, the participant could underreport (or overstate) their psychological symptoms, and for a number of reasons such as social stigma or the patient's uncertainty about how to describe their mental health problems. For the ZLDSI the cutoff score of 13 was determined to have a sensitivity of 85.4% and specificity 50.9% when other diagnoses were included (Rasmussen, et al., 2014). That said, there is a possibility that individuals may have been screened out who were unable to accurately self-report their psychological symptoms, thus were excluded from the care pathways.

Semi-Structured Clinical Interviews

Research with community providers when using structured interviews such as the mhGAP materials, have shown diagnostic accuracy with 86% specificity and 46% sensitivity (Keynejad, Dua, Barbui, & Thornicroft, 2017). With regard to semi-structured clinical interviews there is always the potential to miss details regarding symptoms, and each provider may assess the patient somewhat differently despite having the same supervisor, clinical training, and mental health guidelines. At the same time, semi-structured interviews offer more flexibility and opportunity to assess symptoms based on clinical judgment rather than preliminary threshold criterion. For example, many structured interviews like the WHO WMH CIDI require that if the patient endorses "no" to the first few questions about the specific mental disorder then the clinician discontinues the evaluation for that clinical domain. For countries like Haiti where structured clinical interviews are not validated such examinations would not be appropriate, and descriptions of the psychological symptoms are not always culturally relevant.

Primary Diagnosis Categorization

The primary diagnosis categorization while aligned with WHO guidelines suggests other practitioners may argue a preference for diagnostic specificity. The LCA results however, provide implications that there was no overlap with common mental disorders, severe mental disorders, and neurological conditions in terms of the subgroups. LCA subgroups for common mental disorders, severe mental disorders, and neurological conditions were distinct. We did not observe for example, an LCA class that included both common mental disorders and severe mental disorders, or common mental disorders and neurological conditions. At the same time, despite these transdiagnostic categorizations based on the primary diagnosis LCA results again showed these were distinct categories. Notwithstanding, the present study still provided information on the primary and secondary diagnosis within the primary diagnostic indicator category as it was important to determine the appropriate care pathway.

Demographic Variables

In Haiti there are few research studies that have included even basic demographic information (Wagenaar, et al., 2012). That said, one strength to this study was the inclusion of information such as gender, age, treatment location, number of visits during the observation period, and the type of treatment received. The data that was not captured by the current study included other demographic information such as marital status, religion and spirituality, literacy, work status (employed, seeking work, unemployed), food insecurity, housing stability, electricity access, sanitation access, clean water access, and transportation. The description of demographic

information that might be included in future research was previously described in the "Discussion: Electronic Health Records" section.

Suicidality Variable

Suicidality while thoroughly assessed by community providers and supervised by ZL experts, the details about the patient's suicidality was unclear based on the EHR data entries. Clinically the procedures recommend that positive endorsement of ZLDSI item-12 would prompt for a suicide evaluation. After the patient would be clinically evaluated for suicidal ideation to assess frequency, intensity, duration, plan, intent, and history of a past suicide attempt with a safety plan as needed. However, the EHRs did not include data entry of these suicidality details. This is described further in the "Discussion: Electronic Health Records" section. Regardless, this variable was important to include in the present analyses provided there is very limited research on suicidality in Haiti, and suicidality in global contexts more generally. In low resource settings the most that is known about suicidality includes information about suicide completion where risk-level is elevated for ages 15-19 years-old, for individuals whom reside in rural areas, represent groups who experience ongoing discrimination (LGBTQIA, migrants, refugees), or have had a previous suicide attempt (WHO "Fact Sheet Suicide," 2019).

Number of Visits During the Observation Period

There are limitations to the variable "number of visits during the observation period" since it was unknown when patients attended the primary care clinic or hospital. Based on clinical report from ZL it was not likely a patient was seen for their first visit, prior to the establishment of the EHR database, and then returned for mental health treatment at a later date. At the same time, that

can't be stated with certainty. By taking this variable into account, the value of the odds ratio was close to 1 in the MLR model, which suggested there was not a strong relationship.

Total Symptom Scores vs. Individual Symptom Scores

The LCA analysis in the present study wanted to examine indicators that exceeded evaluation of individual symptoms for a specific mental disorder like major depression and the illness severity. While it would not have changed the focus of the study overall, for the post-hoc analyses it would have been valuable to analyze individual depression and functional impairment symptoms based on the mental disorder subgroups in the MLR models. For example, past LCA models on depression have shown individual symptoms such as hopelessness and guilt may impact the level of clinical severity (Li, et al., 2014), which would have been useful to include. That said, to our knowledge this was the first mental health study in Haiti on mental disorders at-scale and the symptom information was not stored after the clinicians completed the initial intake, as it was not necessary to determine the patient care pathway.

Future Research

Future research, specific to Haiti may examine clinical outcomes of the current community-based mental health system. A latent transition analysis, or regression model would provide an option for such clinical assessment. These analyses can build upon the present study and previous research literature, where depending on the results may suggest that the current framework and task-sharing model offers key information about best practices or standards of care for global mental health. The task-sharing model, as it includes severe mental disorders and neurological conditions with psychiatric medication management provides an opportunity for

continued evaluation of this model. Clinical researchers who evaluate the current care pathways may want to pilot a common elements approach to mental health treatment or the delivery of psychosocial treatments that more specifically target severe mental disorders and neurological conditions. Family Focused Therapy, and cognitive behavioral approaches when adapted for global settings may be beneficial to include as mental health service deliverables in addition to Interpersonal Psychotherapy that primarily targets major depression. Income restricted settings require adaptations to mental health service delivery that are connected to SDGs. Provisions such as travel vouchers, meals, clean water, and support seeking housing, jobs, or education access would be beneficial. Overall, Haitian primary care to date appears to provide an acceptable, feasible, and sustainable community-based mental healthcare treatment model, and the ongoing research and evaluation will determine whether there is additional evidence-based support. With inclusion of risk-management procedures and incident reporting, the additional oversight can be evaluated to also determine the quality of clinical care.

Additionally, it is recommended research continues on the relationship between epilepsy and suicide. Moreover, understanding the causes of seizures might inform standards of care for neurological conditions, especially epilepsy. For example, globally the cause of seizures can also include other environmental considerations such as larva from pork tapeworms, malaria or other parasitic infections, viral infections, and bacterial infections (Senanayake, & Román, 1993) where patients would respond to antibacterial treatment. It was beyond the scope of this study but future research may examine sanitary conditions that include clean water and food hygiene that are not

always readily available and have been known to cause seizures that clinically may look like epilepsy.

More generally, LCA models with the same model indicators from this study may be evaluated in other low resource settings and a confirmatory latent class analysis performed. Such modeling can clarify if task-sharing models for common mental disorders, severe mental disorders, and neurological conditions should include two care pathways where triage is determined by the assessment of depressed mood symptoms, functional impairment, and suicidality. These indicators may determine who will require low vs. high intensity treatment. At present, triage is often assessed with task-sharing models by the evaluation of depressed mood symptoms and suicidality. By including functional impairment this will appropriately triage patients and potentially expand mental health service coverage. Screening for functional impairment may improve with research that locally adapts and validates scales such as the WHODAS. Regardless, patients that endorse more functional impairment will likely benefit from pre-treatment that targets functional impairment to increase the likelihood of future treatment response with clinical interventions like CBT, IPT, and CPT that targets depressed mood or other psychological symptoms. Patients that are more severe and require psychiatric medication initially, would begin to reach the therapeutic dose following a brief psychosocial 4-6 session pre-treatment intervention that targets more severe functional impairment. A pilot study that examines the utility of such low intensity and pre-treatment interventions to target functional impairment would be recommended.

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Appendix A

INITIAL MENTAL HEALTH EVALUATION
Partners In Health Mental Health & Psychosocial Services

Partners In Health

Record Number: _____ EMR Number: _____ Date: ___ / ___ / ___
Site : _____
Surname: _____ Given Name: _____ Nickname: _____
Sex: ☐ M ☐ F Date of Birth (Day/Month/Year): ___ / ___ / ___ Age: _____
Referred by: _____
Address: _____
Commune: _____ Profession: _____ Telephone: _____
Religion: _____ Marital Status: _____

Name of Emergency Contact: _____ Relation: _____
Address: _____ Telephone: _____

Name of Provider: _____

Name of Community Health Worker/Telephone: _____

Chief Complaint (in the patient's own words)**:**

History of Present Illness (Date of symptom onset, precipitants, course, any prior treatment)**:**

DEPRESSION	MANIA	ANXIETY	PSYCHOSIS
• Have you felt sad or lost interest in things for a two week period?	• Did you feel very happy for any reason in the last few days?	• Are you a worrier?	• Do you hear things like voices that other people don't hear?
		• What do you worry about?	
			• Do you see things that other people don't see?
• Do you feel like you've lost interest in everything or only in some things?	• Did you get angry more often in the last few days?	• Are you experiencing: ☐ Panic attacks ☐ Fear of crowded places ☐ Sleep problems ☐ Difficulty concentrating ☐ Fatigue ☐ Irritability ☐ Muscle tension ☐ Restlessness	
			• Do you feel that people are conspiring to harm you – even people whom you don't know?
• Zanmi Lasante Depression Symptom Inventory (ZLDSI): /39	• Do you: ☐ Have any difficulties of staying attentive? ☐ Speak of things that you shouldn't? ☐ Feel like you're worth more than before? ☐ Have a racing thoughts going through your head? ☐ Have an increase in activities? ☐ Sleep less? ☐ Talk without ceasing?	• Do you often experience any 4 of these problems such as: ☐ increased in heartbeat ☐ breathlessness ☐ sweating ☐ trembling ☐ fear; fear of losing control; fear of becoming crazy; fear of death ☐ feeling dizzy ☐ feel like you're losing consciousness	• Are the voices in your head controlling your thought process?

	SUICIDE		VIOLENCE/HOMICIDE	
	Have you ever thought of causing harm to yourself or committing suicide in the past? What about now?		Do you now or have you ever thought about harming others? Have you ever gotten into fights, quarrels or harmed someone else?	
	Ideation	Attempts	Ideation	Acts
Past	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Present	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

If yes, explain _____

_____

Do you have a plan? ☐ Yes ☐ No Are there guns or other weapons in the household? ☐ Yes ☐ No

SUBSTANCE ABUSE						
Do you use any of the following?						
	Beer	Home Brew	Liquor	Tobacco	Marijuana	Cocaine
Past	☐	☐	☐	☐	☐	☐
Present	☐	☐	☐	☐	☐	☐

If yes, explain quantity, first use, last use: _____

_____

Need to cut down? ☐ Annoyed or angered by others who comment on your use? ☐ Guilty about using? ☐

In order to function properly, do you need to take that substance before starting your day? ☐

TRAUMA						
Did you ever experience a trauma, such as physical, sexual, or emotional abuse, that is impacting your current functioning?						
	Physical	Emotional	Sexual	Re-experiencing	Hyperarousal	Avoidance
Past	☐	☐	☐	☐	☐	☐
Present	☐	☐	☐			

If yes, explain: _____

_____

Do you feel safe in your current environment? _____

PAIN	WHOLE BODY	HEAD/EARS/EYES/NOSE/THROAT	NECK
☐ Are you experiencing pain in your body?	• Is there a change in your: ☐ Weight? ☐ Thirst? ☐ Fever?	☐ Sight problems? ☐ Hearing problems? ☐ Voice change? ☐ Dizziness? ☐ Gum and teeth status? ☐ Difficulty swallowing?	☐ Stiffness of the neck?
BREATHING	**HEART/ARTERIES**	**DIGESTIVE SYSTEM**	**SKIN**
☐ Are you having problems breathing? ☐ Are you coughing? ☐ Do you cough out blood or find blood in your snot?	☐ Do you have an increased heartbeat? ☐ Having chest pain? ☐ Any swelling?	☐ Heart burn? ☐ Gastric Reflux? ☐ Vomiting? ☐ Constipation, diarrhea, gas?	☐ Any changes in your skin?
MUSCLES	**APPENDAGES (HANDS AND FEET)**	**GENITALS/URINATION**	**NEUROLOGICAL**
☐ Are they stiff? ☐ Swollen? ☐ Reddened?	☐ Swollen?	☐ Do you have any STDs causing discharge (more than usual) in your genitals? How much? How often? ☐ Any problems when urinating (pain, amount/color of urine, blood in urine)?	☐ Any numbness? ☐ Uncontrolled movements?

NAME OF THE ILLNESS	HOSPITALISATION/ HOME TREATMENT	MEDICATION
☐ None	☐ None	☐ None

Psychiatric Family History:

Past Medical History and Active Medical Problems

☐ Head Injury:

Last Date Of Menstruation: ___ / ___ / ___

☐ Loss Of Consciousness:

Other Things:

Medication/Allergies/Side Effects:

Medical Family History:

Social/Cultural History (include childhood family configuration, urban or rural setting, level of education, romantic relationships, and occupation or other means of financial support)**:**

Legal Problems:

PHYSICAL EXAM (PHYSICIAN)

Vital Signs: _____

HEENT: _____

Chest/Lungs: _____

Cardio-vascular: _____

Abdomen: _____

Genitals: _____

Extremities: _____

Skin: _____

Lymph nodes: _____

NEUROLOGIC EXAM (PHYSICIAN)

Cranial nerves II to XII Intact ☐ If impaired, specify _____

Motor: _____

Pronator drift: _____

Sensory: _____

Vibration: _____ Position: _____

Reflexes: DTR _____ Clonus _____ Babinsky _____

Coordination and Gait: Rapid alternating movements _____ Nose finger test _____

Romberg _____ Gait _____ Heel toe walk test _____

MENTAL STATUS EXAM

General Appearance	☐ well groomed	☐ disheveled	☐ overdressed, elaborate	
Orientation	☐ O x 3	☐ disoriented to time	☐ disoriented to place	☐ disoriented to person
Behavior	☐ WNL ☐ tics	☐ retardation	☐ agitation	☐ tremor
Speech	☐ WNL	☐ slowed	☐ pressured	☐ slurred
Mood	☐ _____			
Affect	☐ euthymic ☐ irritable ☐ congruent with speech content	☐ dysphoric ☐ suspicious ☐ incongruent with speech content	☐ euphoric ☐ labile ☐ other: _____	☐ anxious ☐ flat

Thought Process	☐ linear ☐ tangential ☐ perseverative ☐ illogical ☐ loose associations ☐ _____
Thought Content	☐ WNL ☐ vague ☐ persistent preoccupation with: ☐ suicidal ideation ☐ homicidal ideation Delusions: ☐ none ☐ paranoid ☐ grandiose ☐ other: _____ Perceptual Disturbances/Hallucinations: ☐ none ☐ auditory ☐ visual ☐ olfactory ☐ gustatory ☐ tactile
Insight:	☐ poor ☐ limited ☐ good
Judgment/Impulse Control:	☐ poor ☐ limited ☐ good

General Impressions: _____

_____

_____

BIOPSYCHOSOCIAL FORMULATION (including patient's strengths and coping strategies)**:**

_____

_____

_____

DIAGNOSIS:

Axis I: _____

Axis II: _____

Axis III: _____

Axis IV: _____

PLAN:

Psychological Treatment Plan

Treatment Goals

1. Goal: _____
2. Goal: _____
3. Goal: _____

Intervention

☐ Interpersonal Psychotherapy (IPT) ☐ Medication ☐ Behavioral Activation

☐ Psychoeducation ☐ Parent/Family Supportive Therapy ☐ Other _____

☐ Relaxation Training ☐ Supportive Psychotherapy

☐ Grief Support ☐ Parent Skills Training

Frequency

☐ Once per week ☐ Bi-weekly ☐ Once per month

Number of Sessions:

☐ 4–6 sessions ☐ 6–8 sessions ☐ 8–10 sessions ☐ 10–12 sessions

Primary Clinician:_____ Appointment Date: ___ / ___ / ___

Referrals

CHW

Name:_____ Appointment Date: ___ / ___ / ___

Reason for Referral: _____

Social Worker

Name:_____ Appointment Date: ___ / ___ / ___

Reason for Referral: _____

Other Plan: (follow-up with family, etc.)

FOLLOW-UP

Psychiatric Medication

Medication	Dose	Frequency	Quantity	Refill Date
Risperidone				
Haloperidol				
Diazepam				
Carbamazepine				
Valporic Acid				
Other: _____				

Hospitalization:

Date of Admission: ___ / ___ / ___

Reason for Admission: _____

1.26.16

Appendix B

ZANMI LASANTE DEPRESSION SYMPTOM INVENTORY (ZLDSI)

Partners In Health

Date dd/mm/yy

	Pandan 15 jou ki sòt pase la yo, konbyen fwa yon nan pwoblèm sa yo te fatige ou ?	Di tou	Konbyen fwa yon nan pwoblèm sa yo te fatige ou ?	Pandan kèk jou (1–5 jou)	Plis pase yon semèn (6–9 jou)	Preske chak jou (10–15 jou)
1	Santi ou de la la.	0	—	1	2	3
2	Santi kè sere.	0	—	1	2	3
3	Kalkile twòp.	0	—	1	2	3
4	Kriye oubyen anvi kriye	0	—	1	2	3
5	Santi anyen preske pa enterese ou.	0	—	1	2	3
6	Santi ou kagou, dekouraje ak lavi, oubyen pèdi espwa nèt ale.	0	—	1	2	3
7	Gen difikilte pou dòmi pran ou.	0	—	1	2	3
8	Santi ou fatige oubyen ou manke fòs.	0	—	1	2	3
9	Ou pa gen apeti.	0	—	1	2	3
10	Ou santi lavi-w pase mal oubyen ou santi-w pa alèz ak tèt-w.	0	—	1	2	3
11	Fè mouvman oubyen pale tèlman dousman, menm lòt moun wè sa.	0	—	1	2	3
12	Ou di nan tèt ou: Pito-w te mouri, oubyen ou gen lide pou fè tèt-w mal.	0	—	1	2	3
13	Gen difikilte pou rete dòmi jouk li jou.	0	—	1	2	3
			Totals	(+)	(+)	

(=) **ZLDSI Score** _____

8.4.15

Appendix C

WHODAS 2.0
WORLD HEALTH ORGANIZATION
DISABILITY ASSESSMENT SCHEDULE 2.0

12
Interview

Section 4 Core questions

Show flashcard #2

In the past 30 days, how much difficulty did you have in:		None	Mild	Moderate	Severe	Extreme or cannot do
S1	Standing for long periods such as 30 minutes?	1	2	3	4	5
S2	Taking care of your household responsibilities?	1	2	3	4	5
S3	Learning a new task, for example, learning how to get to a new place?	1	2	3	4	5
S4	How much of a problem did you have joining in community activities (for example, festivities, religious or other activities) in the same way as anyone else can?	1	2	3	4	5
S5	How much have you been emotionally affected by your health problems?	1	2	3	4	5

In the past 30 days, how much difficulty did you have in:		None	Mild	Moderate	Severe	Extreme or cannot do
S6	Concentrating on doing something for ten minutes?	1	2	3	4	5
S7	Walking a long distance such as a kilometre [or equivalent]?	1	2	3	4	5
S8	Washing your whole body?	1	2	3	4	5
S9	Getting dressed?	1	2	3	4	5
S10	Dealing with people you do not know?	1	2	3	4	5
S11	Maintaining a friendship?	1	2	3	4	5
S12	Your day-to-day work/school?	1	2	3	4	5

H1	Overall, in the past 30 days, how many days were these difficulties present?	***Record number of days*** ____
H2	In the past 30 days, for how many days were you totally unable to carry out your usual activities or work because of any health condition?	***Record number of days*** ____
H3	In the past 30 days, not counting the days that you were totally unable, for how many days did you cut back or reduce your usual activities or work because of any health condition?	***Record number of days*** ____