The Impact of Family Functioning on Child Mental Health Service Use and Access

Irina Ioana Oltean

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AUTHOR'S DECLARATION

This thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners. I understand that my thesis may be made electronically available to the public.

STATEMENT OF CONTRIBUTIONS

This thesis is the work of Irina Oltean under the supervision of Dr. Mark Ferro with contributions from Dr. Samantha Meyer and Dr. Chris Perlman. Operating funds for this study were awarded to Dr. Ferro by Hamilton Health Sciences (Grant No. NIF-14363). Irina Oltean is supported by funds from the Early Researcher Award awarded to Dr. Mark Ferro by the Ministry of Research, Innovation and Science. Dr. Ferro is supported by the Canada Research Chairs Program.

ABSTRACT

Background

In Canada, the prevalence of mental illness is high among young people with 13% of Canadian youth aged 15-24 years affected. This striking mental health burden warranted further investigation of the contextual (i.e., family-level) determinants of mental illness early in life, and the extent to which these family factors influenced access and use of mental health services. Previous evidence shows that indicators of less supportive family environments, and family dysfunction are robust factors predicting the onset of internalizing and externalizing mental illness in children. Family dysfunction has also been associated with decreased medical adherence, which can lead to a subsequent increase in "crisis" mental health care (e.g., hospitalizations). However, less is known about the extent to which the family environment is associated with mental health service use in children. In an attempt to address this gap, this research examined the interrelationships of family functioning, child mental illness, and mental health service use and access. Understanding the role of the family in accessing and using child mental health services is knowledge needed to improve the provision of health services to children and families, particularly through the adoption of family-centred care strategies in inpatient, outpatient, and community settings.

Objectives & Hypothesis

The aims of this research project were to: 1—Examine associations between family functioning and internalizing versus externalizing mental illness. *Better family functioning will be associated with lower odds of internalizing (depression, anxiety) and externalizing (attention-deficit hyperactivity, oppositional defiant, conduct) illnesses.* 2—Examine associations between family functioning and odds of past-year health professional consults, hospitalizations, and

length of hospital stay. *Better family functioning will be associated with lower odds of past-year health professional consults, hospitalizations, and length of hospital stay.* 3—Identify which domains of family functioning are associated with odds of internalizing versus externalizing mental illness, past-year health professional consults, hospitalizations, and length of hospital stay. *Problem solving, communication, and behaviour control will be the most relevant aspects of family functioning in predicting mental illness and service use and access.*

Methods

Data came from a cross-sectional study, which recruited 100 youth aged 4-17 years currently receiving mental health services (inpatient or outpatient) and their parents at a large paediatric tertiary care centre in Ontario. Family functioning was measured using the McMaster Family Assessment Device (FAD), youth mental illness using the Mini International Neuropsychiatric Interview, and mental health service use and access using items from the 2012 Canadian Community Health Survey (Mental Health). Controlling for relevant covariates, associations between family functioning and child mental illness and use of mental health services were examined using regression modelling (binary logistic and Poisson regression).

Results

The associations between parent FAD scores and major depressive disorder (MDD) [OR=0.88 (0.81, 0.97)], separation anxiety disorder (SAD) [OR=0.91 (0.83, 1.00)], and oppositional defiant disorder (ODD) [OR=0.91 (0.84, 0.99)] were similar in magnitude. There were no statistically significant associations between parent FAD total or domain scores and being hospitalized, accessing any health professional, and number of hospitalizations. Higher scores on affective involvement were associated with greater odds of MDD [OR=2.34 (1.09, 5.01)], generalized anxiety [OR= 2.34 (1.09, 5.01)], and greater stay in hospital [OR= 2.04 (1.76,

2.36)]. Higher scores on problem solving were only associated with greater stay in hospital [OR= 1.41 (1.24, 1.61)]. Higher reports of behaviour control were correlated with lower odds of SAD [OR= 0.60 (0.38, 0.96)], any type of social phobia [OR= 0.50 (0.28, 0.88)], ODD [OR= 0.53 (0.33, 0.85)], and less stay in hospital [OR= 0.83 (0.76, 0.91)]. Higher scores on affective responsiveness and roles were associated with less stay in hospital [OR=0.76 (0.69, 0.84); OR= 0.70 (0.63, 0.78)].

Significance

Findings have implications for the provision of clinically based, family-centred mental health services for children and youth. Family-centred care strategies are an effective approach to promoting positive mental health among children by encouraging family members to be actively involved in the mental health care of their child. While facilitating family-centred care strategies, primary care providers could prioritize screening for indicators of family functioning. Mental health professionals can also facilitate family-centred interventions that foster better family functioning by targeting specific domains that require improvement unique to each family. Tailored family-centred care strategies could cultivate better family functioning solutions. These strategies could potentially reduce strain on the health care system. Saved funds could be diverted to other clinical priorities, with the hopes of improving health system efficiency.

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LIST OF ABBREVIATIONS

Ministry of Health and Long term Care	**(MOHLTC)**
Ministry of Children, Community and Social Services	**(MCCSS)**
Ministry of Education	**(MOE)**
Ontario Health Insurance Plan	**(OHIP)**
Family Environment Scale	**(FES)**
Family Relations Scale	**(FRS)**
Family Assessment Device	**(FAD)**
Mini International Neuropsychiatric Interview for Children and Adolescents	**(MINI-KID)**
Major Depressive Disorder	**(MDD)**
Separation Anxiety Disorder	**(SAD)**
Generalized Anxiety Disorder	**(GAD)**
Attention-deficit Hyperactivity Disorder	**(ADHD)**
Oppositional Defiant Disorder	**(ODD)**
Conduct Disorder	**(CD)**
Canadian Community Health Survey (Mental Health)	**(CCHS-MH)**
Mental Health Services Model	**(SR1)**
Computer-assisted Interviewing	**(CAI)**
Odds Ratio	**(OR)**
Standard Deviation	**(SD)**
Confidence Interval	**(CI)**
Degrees of Freedom	**(DF)**
Root Mean Square Error of Approximation	**(RMSEA)**
Comparative Fit Index	**(CFI)**
Tucker-Lewis Index	**(TLI)**
Exponentiation	**(exp)**

LIST OF SYMBOLS

Cronbach's alpha	α
Index of time or space	t
Beta	β
e constant/Euler's number	e
Concordance statistic	c
Pearson's correlation coefficient	r
p-value	p
Number of participants in the sample	n
Predictor variable	X
Outcome variable	Y
The expected value or mean of Y	μ
Eta	η

CHAPTER 1: INTRODUCTION

1.1. Vulnerability of Youth to Mental Illness

Young people aged 15-24 years are at an increased risk for mental illness in Canada (1). In fact, it has been estimated that 1.2 million children and youth are affected by mental illness and that by the age of 25, nearly 20 percent of Canadians will be affected (2). Mental illness describes a class of conditions that may diminish productivity, increase suffering, and increase use of mental health services. Some of the mental illnesses that are prevalent in youth include internalizing (e.g., anxiety, depression) and externalizing (e.g., attention-deficit hyperactivity disorder (ADHD), oppositional defiant) illnesses. Features of internalizing illnesses include social withdrawal, which are associated with difficulties in creating and sustaining social relationships. While internalizing illnesses focus on the presence of emotional problems (3), externalizing illnesses focus instead on behavioural issues such as aggressive behaviour, defiance, and a lack of impulse control (4). Symptoms of both types mental illnesses tend to persist over time, which may consequently lead to school attrition, poor physical health, substance abuse, suicidal ideation, and greater use of long-term mental health services (4,5).

Youth are particularly vulnerable to developing mental illness given that this developmental stage is characterized by a tumultuous time with changes in autonomy and family environment (6). Considering that youth are becoming increasingly autonomous from their parents, there is an added stress for them to lead an independent lifestyle. This expectation may increase their development of anxiety as they are unable to cope with this newfound independence to effectively manage school, work, and life demands (7). Additionally, the potential for youth to develop autonomy may be affected by the presence or absence of an overprotective family environment (6). Youth living in overprotective family environments or

those who experience high parental expressed emotion (i.e., greater criticism and hostility), are more likely to develop depressive, anxiety, and bipolar illnesses (8).

Other features of the family environment, such as parental involvement and parent-youth conflict, also affect symptoms of depression and behavioural problems in youth (9). When parents are increasingly warm and accepting (i.e., show a greater degree of parental involvement), youth are more likely to disclose information about their activities. Consequently, the likelihood of good psychological adjustment among these youth is higher and the presence of antisocial behaviour and school misconduct lower (9). In addition, youth of parents who demonstrate caring attitudes experienced lower levels of depressed mood (9). However, parent-youth conflict (i.e., verbal disagreements, physical abuse, etc.) is associated with problematic behaviours and depressed mood in youth (9). Lastly, when parents enforce disciplinary actions and control over the behaviours and decision-making of youth, problem behaviour in youth is exacerbated (9).

1.2. Burdens of Mental Illness

There are both individual and societal/system level burdens associated with mental illness. Specifically, the presence of mental illness in the Canadian population places a financial burden on the health care system. In 2011, the annual direct costs (healthcare, certain social services and income support) attributed to mental illness surpassed $42.3 billion (10). The cumulative economic impact of direct costs from mental illness is expected to rise to about $2.3 trillion in the next thirty years (10). However, the direct costs included do not take into account costs associated with caregiving (i.e., caring for a child with mental illness) or those incurred outside of mental health care and the health system (i.e., the judicial system). Therefore, they likely underestimate the true direct costs associated with mental illness. The indirect cost

(annual productivity impact) in the workplace as a result of mental illness was approximately $6.4 billion in 2011 (10). Another indirect cost (cumulative 30-year productivity) impact of mental illness is expected to rise to $198 billion (10).

Mental illness has psychological, financial, and social impacts on youth and their families (7,9,10). Adverse psychological outcomes can include the inability for youth to cope with life circumstances (7). Financial consequences may refer to greater work loss and increased mental health service utilization as youth age (10). The social cost of mental illness may refer to the caregiver stress experienced by immediate family members caring for a child with mental illness (10). Given these difficulties, health professionals should focus on promoting positive family-centred care strategies to prevent the development of mental illness. Increased focus on these strategies may consequently lead to a reduction in future health care costs and more importantly, improve the well being of youth.

1.3. Investigating Family-level Determinants

Investigating the contextual (i.e., family-level) determinants of mental illness is becoming increasingly important due to the fact that the family environment plays an important role in shaping the social and mental development of children (11). More precisely, adverse family contexts can affect the development of certain internalizing mental illnesses like obsessive compulsive disorder (12). Furthermore, family characteristics such as the parent-child relationship and family member interaction have been identified as significant factors predicting adolescent mental health (13). This is unsurprising considering the role of the family is to function as a critical microsystem, provide basic necessities, and to maintain and reinforce positive or negative behaviour of children (14). Therefore, examining the particular effects of family functioning on the onset of child mental illness is crucial.

Family functioning relates to the capacity for a family to work together in an effective fashion to overcome conflicts and to fulfill basic needs (15). Family functioning and the family system perspective are intertwined in that this view assumes that family members form a complex, interconnected system affecting the degree to which a family functions optimally (15). Furthermore, the presence of a mental illness has the capacity to change the functioning of the family system. Contrary to this, family dysfunction can be characterized by family strain, distress, conflict, lack of cohesion, and violence (9). Among these, cohesion and conflict are some of the most important factors in predicting adolescent psychological maladjustment and adolescent depression (13). Aspects of family functioning may affect the onset of mental illness. In fact, increased family conflict and lessened family support have been associated with the onset of certain mental illnesses such as hair pulling disorder (12). Additionally, prior literature has shown that high levels of disruption, such as marital conflict, were present in families of children with obsessive compulsive disorder (12). The above examples denote that a link exists between family functioning and the onset of mental illness. Furthermore, the presence of mental illness in familial circumstances of marital conflict (16), low family cohesion (17) and subsequently, high family conflict (18) has been documented.

1.4. Services Provided to Youth with Mental Illness or at Risk for Mental Health Problems

Youth with mental illness can receive professional counselling by phone or online and/or talk to a school counsellor, nurse, family doctor, a registered psychiatrist, psychologist, social worker, case worker, or psychotherapist about their mental health concerns. Non-for-profit mental health agencies and associations, self-help resource centres, targeted intensive services (e.g., inpatient and outpatient clinics), therapies, and crisis services, (i.e., for suicide) are presently available for youth with mental illness (19). Some of these downstream services (e.g.,

outpatient individual family and group treatment, family-based cognitive-behavioural therapies, family education of youth major depression, etc.) can be used to support children with mental illness and their families (20–22). Currently, there is no standardized mental health care provided at the primary care level (23). There does however exist mental health support in secondary and tertiary levels of care but community-based settings use numerous methods to assess risk for mental health problems across vulnerable populations (e.g., immigrants, Indigenous people, and youth, in general) obtained by health professionals, who ask questions around exposures to stressors, needs, support systems, trauma, and uncertainty during transition periods (i.e., migration, moving schools, etc.) (24,25). Youth may interact first with a mental health organization or agency for initial assessment of mental health risk over the phone or in-person. If further assessment is needed, youth can then be forwarded to a psychiatrist within the area. If no psychiatrist is available, they have access to telepsychiatry options (25). Therefore, mental health problems can also be assessed among an online community, which connects mental health care resources to children, families, and health care providers (e.g., eMentalHealth.ca, WalkAlong, etc.) (26).

To add to the complexity, there also exist multiple preliminary screening tools for mental health problems such as the parent, teacher, and youth-reported Achenbach Child Behaviour Checklist, the parent and self-reported Paediatric Symptom Checklist, and the parent-reported Child/Adolescent Psychiatry Screen (27). There are also illness-specific screening tools like the parent and youth-reported Screen for Child Anxiety Related Emotional Disorders, youth-reported Social Phobia Inventory, the parent and teacher-reported ADHD

Rating Scale IV, and the youth-reported Beck Depression Inventory, among multiple other condition-specific screening tools (28).

There seems to be no universal approach in assessing mental health problems across agencies, health centres, or hospitals (25). Despite this lack of universality, collaborative and comprehensive action plans like the Canadian Collaborative Mental Health Initiative (29) or Ontario's Comprehensive Mental Health and Addictions Strategy (Open Minds, Healthy Minds) exist. These plans guide health professionals in intervening and identifying youth with mental health problems earlier, improving access to excellent mental health care for families and youth (30), and encourage increased integration of mental health and addictions services within primary care (29).

1.4.1. Gaps in the Mental Health Care System

One of the disadvantages associated with the mental health care system is the lack of universality in screening. Youth also experience mental health service gaps. Among youth with addictions problems, there are limited substance abuse services requiring long wait times. There is also limited access to publically funded therapies (i.e., psychotherapy) through Medicare and youth struggle to find services near their home, may be unaware of the services offered, and have difficulties navigating the system after referral to a mental health specialist (31).

1.4.2. Improving Identification and Navigation for Families of Youth with Mental Illness

The 2016 Mental Health and Addictions Moving Forward report detailed methods for improving identification of mental illness and mental health system navigation. Some of these methods included offering increased mental health promotion in schools, campuses, workplaces, and in the community, educating caregivers and teachers around the signs and

symptoms of youth at risk, and sharing knowledge around service standards and referral pathways to children and families as they move through the mental health system (31).

1.4.3. Funding Providers of Mental Health Care

Funding is a key issue that affects the provision of mental health care. The Ministry of Health and Long term Care (MOHLTC), the Ministry of Children, Community and Social Services (MCCSS), and the Ministry of Education (MOE) are key stakeholders involved in the funding of mental health services. Broadly, the MOHLTC funds community mental health initiatives (e.g., crisis intervention, community treatment, management of intensive care, and interventions for early psychosis), addictions programs (e.g., assessment and intake, peer and family support, etc.) and court support programs (e.g., supportive housing and safe beds) (30). There seems to be overlap in the funding of these services with the MCCSS. Some services that the MCCSS funds include: targeted prevention services, brief services (e.g., drop-ins), counselling and therapy, and intensive services (19). Finally, the MOE funding is directed towards educational programming for mental health literacy, training for educators on early identification and intervention, improvement of mental health resources in schools, and collaboration between schools and community agencies for seamless transition in treatment referral (32).

1.5. Indicators and Definitions of Mental Health Service Use and Access

Treatment referral and medical/treatment adherence may be indicators of mental health service use. Definitions for service use vary widely in the literature. Burns et al. defined one indicator of mental health service use as hospitalizations in a medical inpatient unit for emotional or behavioural problems (33). According to the National Hospital Discharge Survey for 2006, mental health service use was defined as the number of discharges, days of care, and average length of hospital stay (34). The Canadian Mental Health Association describes mental

health service access as timely access to physicians, psychiatrists, psychologists, social workers, peer support workers, counsellors, medications, or other specialized providers (35).

1.5.1. Family Functioning and Health Service Use

With respect to family functioning, most knowledge of medical adherence and health service use in children has focused on children with physical health conditions (36–38). There is some limited research demonstrating poor medical adherence among children with mental illness living in dysfunctional families characterized by parental mental health problems, substance abuse, child abuse, or neglect (6). Better family functioning typically indicates better medical adherence and subsequently lower health service use, including fewer hospitalizations (39–41).

1.5.2. External Factors Affecting Youth Mental Health Service Use and Access

Apart from family functioning, there are also predisposing, contextual, enabling, and needs based factors (42) that may affect the ability for youth to use and access mental health services. Predisposing factors include the age, sex, education, ethnicity, and health beliefs (i.e., values and knowledge around health services) that youth adopt (42). Contextual factors refer to the collective values, political opinions, and cultural norms surrounding youth. Enabling factors assess the level of wealth that parents of youth have, as well as the cost of mental health services excluding those services already covered through parent's work insurance or covered publically. Moreover, organizational factors, which enable or prevent youth from accessing mental health services, refer to the ability for youth to travel and waiting times associated with receiving mental health care. Lastly, contextual needs based factors are rooted in environmental health. Environmental needs may refer to the level of crime and crime-related injuries or death in the youth's community (42).

1.6. Family Functioning, Hospitalizations, and Length of Hospital Stay

The effect of family functioning on hospitalizations from mental illness also warrants examination. Woo et al. (2015) demonstrated that two characteristics of family functioning (caregiver criticism and perceived family burden) predicted early clinical relapse leading to hospitalization in people with schizophrenia (43). Family burden and expressed emotion (i.e., family members' attitudes towards the participant) were considered factors predicting subsequent hospitalization among people with a first psychotic episode and those with psychosis (44). Lastly, caregiver's critical attitude or criticism towards the participant with schizophrenia was found to reduce time to subsequent hospitalization potentially as a result of greater criticism expressed by the caregiver (43,45,46).

It is important to note that schizophrenia has a genetic predisposition yet not all youth who are predisposed will develop the illness (47). In fact, there may be other factors, such as the presence of childhood trauma (e.g., physical, verbal abuse, neglect, etc.), that influence the onset of schizophrenia regardless of genetic predisposition (48). One study determined that the connection between early trauma and schizophrenia remained significant even after controlling for maternal or paternal history of schizophrenia (48).

Present research supports the presence of elevated expressed emotion on the part of the caregiver, as a potential factor associated with a higher number of rehospitalizations and increased lengths of hospital stay (46,49). Another study produced similar findings in which the family environment influenced the course of depressive illness. In particular, participants with depression living in dysfunctional families had poorer outcomes over a 12-month follow-up period characterized by higher levels of depression, lower percentage of recovery, and worse overall functioning than participants with depression from a functional family (50,51). Finally,

excessive criticism was demonstrated to increase the likelihood of relapse in participants with schizophrenia (52) bipolar disorder (53) and depression (54) after discharge from hospital.

1.6.1. Definitions for Specific Family Factors

A relationship between child mental illness and dysfunctional family factors particularly with regards to problem solving, communication, and behaviour control has been established. Problem solving in the context of the family environment can be explained as the ability of families to resolve issues in order to maintain effective family functioning. These issues refer to internal (e.g., marital conflict) or external factors (e.g., parent socioeconomic status) that threaten the functional capacity of the family (55). Communication refers to the ability for family members to exchange information (15). Behaviour control refers to the standards by which family members behave and how they express their behaviour (55). Behavioural control can also refer to the ways in which the family reacts to physically dangerous situations, psychobiological needs or drives, and interpersonal situations (55).

1.6.2. Dysfunctional Family Factors and the Presence of Mental Illness

Evidence suggests that children diagnosed with ADHD tend to live with family members that lack good communication and responsiveness skills and demonstrate poor problem solving (56,57). Other studies determined that the presence of marital disharmony was damaging to children (58–60). In particular, the presence of parental conflict was strongly associated with poor behaviour control exhibited by children. Children demonstrated increased externalized behaviours such as aggression and anger as opposed to emotional or internalized behaviours (60). The literature thus provides examples of connections between dysfunctional family environments and the onset of internalizing illnesses (12) and externalizing symptoms in children (60).

CHAPTER 2: STUDY RATIONALE AND RESEARCH OBJECTIVES

2.1. Summary of Existing Literature

Prior research has supported the association between family dysfunction and reduced medical adherence in participants with physical and mental illness (61–63). Specifically, recent studies have examined the association between family dysfunction and decreased medical adherence, which can lead to an increase in "crisis" mental health care or hospitalizations (18,55,56). The development of child mental illness within dysfunctional family environments has also already been explored (56,57,60).

2.1.1. Knowledge Gaps in Family Functioning, Mental Illness, and Mental Health Service Use and Access

This study extended the research already completed by examining the presence of internalizing versus externalizing illness in children from various family environments. An investigation of particular family factors (e.g., family or marital conflict, support, and cohesion) and the onset or presence of child mental illness has occurred. However, previous literature has failed to regard the extent to which the family environment is associated with mental health service use and access in children. Other studies have only focused on the associations between parenting behaviour (e.g., use of physical contact, management of child anxious behaviour, discipline, etc.) and the development of child emotional symptoms (5) without considering contextual factors other than problem solving, communication, and behaviour control, and their potential effects on the onset of child mental illness.

Typically in this field of research, mothers report on family functioning, which limits the contribution of other family members (e.g., fathers and children). The participation of youth in family functioning research enables more comprehensive perceptions, which may aid mental health professionals in the design of intervention strategies for families. Self-reported measures

commonly used in family functioning research such as the Family Environment Scale (FES) and the Family Relations Scale (FRS), which examine the social and environmental characteristics of the family, and the influence of family on the psychopathology of youth (63), may be prone to self-serving bias and perception distortions (12). Furthermore, in a systematic review of these self-reported family assessment measures, the FES and FRS demonstrated less than acceptable internal consistency reliability and validity (63). In contrast, the measure of family functioning used in the current study, the McMaster Family Assessment Device (FAD), demonstrates robust psychometric properties (64,65).

2.1.2. Study Implications

Investigating the interrelationships between family functioning, child mental illness, and mental health service use and access has important implications. First, estimates of particular mental illness (internalizing versus externalizing) in children exposed to poorer family functioning could help inform the allocation of resources aimed at improving the mental health outcomes of families and children with mental illness.

Second, examining how family functioning influences the use and patterns of mental health services may be pivotal to refining the integration of family-centred care strategies into the health care system to best support the mental health needs of youth and families. Integrating these strategies could prevent the disruption of the family environment and promote positive mental health among children and families.

Lastly, identifying the specific aspects of family functioning associated with child mental illness and service use and access may aid health care professionals in defining the focus of the family-centred care strategies. Particular focus on certain aspects of family functioning unique

to children and families could help mental health professionals deliver targeted care and improve mental health outcomes for children and families.

2.2. Objectives and hypotheses

This study examined the extent to which family functioning was associated with child mental illness and mental health service use and access. Specifically, this study:

1. Examined associations between family functioning and odds of internalizing versus externalizing mental illness;
2. Examined associations between family functioning and odds of past-year health professional consults, hospitalizations, and length of hospital stay; and,
3. Identified which domains of family functioning were associated with odds of internalizing versus externalizing mental illness, past-year health professional consults, hospitalizations, and length of hospital stay.

It was hypothesized that (1) better family functioning would be associated with lower odds of externalizing illnesses and internalizing illnesses; (2) better family functioning would be associated with lower odds of past-year health professional consults, hospitalizations, and length of hospital stay; and (3) problem solving, communication, and behaviour control would be the most relevant aspects of family functioning in predicting mental illness (i.e., internalizing versus externalizing), service use (i.e., hospitalizations and hospital stay), and access (i.e., health professional consults).

2.3. Pearlin's Stress Process and Andersen's Health Service Use Theoretical Frameworks

The Stress Process Model is composed of four domains: (1) the background and social context of the parenting situation; (2) primary stressor(s); (3) mediators of stress; and (4) stress outcomes (66). The social context that pertained to this study included the age, sex, and

immigrant status of the youth, parent education, and income. The presence of certain sociodemographic characteristics (e.g., being an immigrant from a low income background) might have affected the quality of the individual's family environment (67), and subsequently the onset of mental illness (68) and service use and access (69). Primary stressors were factors that may have arisen as a result of the mental illness present or contributed to the onset of mental illness, which required caregiving by the parent. These included indicators of problematic behaviour, like family dysfunction. The primary stressors thus considered problem solving, communication, behaviour control, and other domains of family functioning. Moreover, the presence of internalizing and externalizing mental illness, also acted as a primary stressor, having the potential to influence the type of family dysfunction present or mental health services used. Mediators such as coping and social support and secondary stressors such as changes in lifestyle and threats to self-esteem fell outside the scope of this study, and were not applicable. Consistent with the Stress Process Model, the outcomes in this study referred to mental health service use (e.g., number of hospitalizations, length of hospital stay) and access (e.g., seeing or talking to health experts) among youth with mental illness.

The Health Service Use Model specifies predisposing factors, kinds of services received, site or location where they are delivered, the purpose of the services, and the associated time interval (42,70). Cultural norms are one of the predisposing factors significant to this model (42). They refer to the expectations of behaviour within a cultural group, which are often represented as shared beliefs (71). Because cultural norms have the potential to influence individual behaviour, they may affect the perception of mental health services and

subsequently impact use of these services. Therefore, being aware of the potential impact of culture may help in refining and improving future delivery of family-centred care strategies.

For this study, youth received inpatient or outpatient services at McMaster Children's Hospital during 2015-2017 for the purpose of treating their mental illness and improving their mental health. Inpatient services included: behavioural analysis assessment, youth groups, reviewing of medications, socializing with youth, and teaching them novel skills in unfamiliar situations. (72). Outpatient services included: mental health assessments, individual family and group treatment, psychiatric consultation and assessment, home-based services, psychological testing and consultation services, and emergency services (20). Child and youth workers, nurses, occupational therapists, psychiatrists, psychologists, social workers, and teachers were involved in facilitating these services (20,72).

These models were merged. The Stress Process Model permitted us to explore the relationships between the social context of the parent (i.e., confounders such as age and sex) and primary stressors such as the domains of family functioning (i.e., behaviour control, communication etc.) and mental illness (i.e., anxiety, depression, ADHD etc.). The impact of family functioning on mental health service use (i.e., hospitalizations, length of hospital stay) and access (i.e., health professional consults) was examined through the Health Service Use Model. Combining these models enabled us to adopt a more comprehensive perspective to effectively explore these intricate associations (Figure 1).

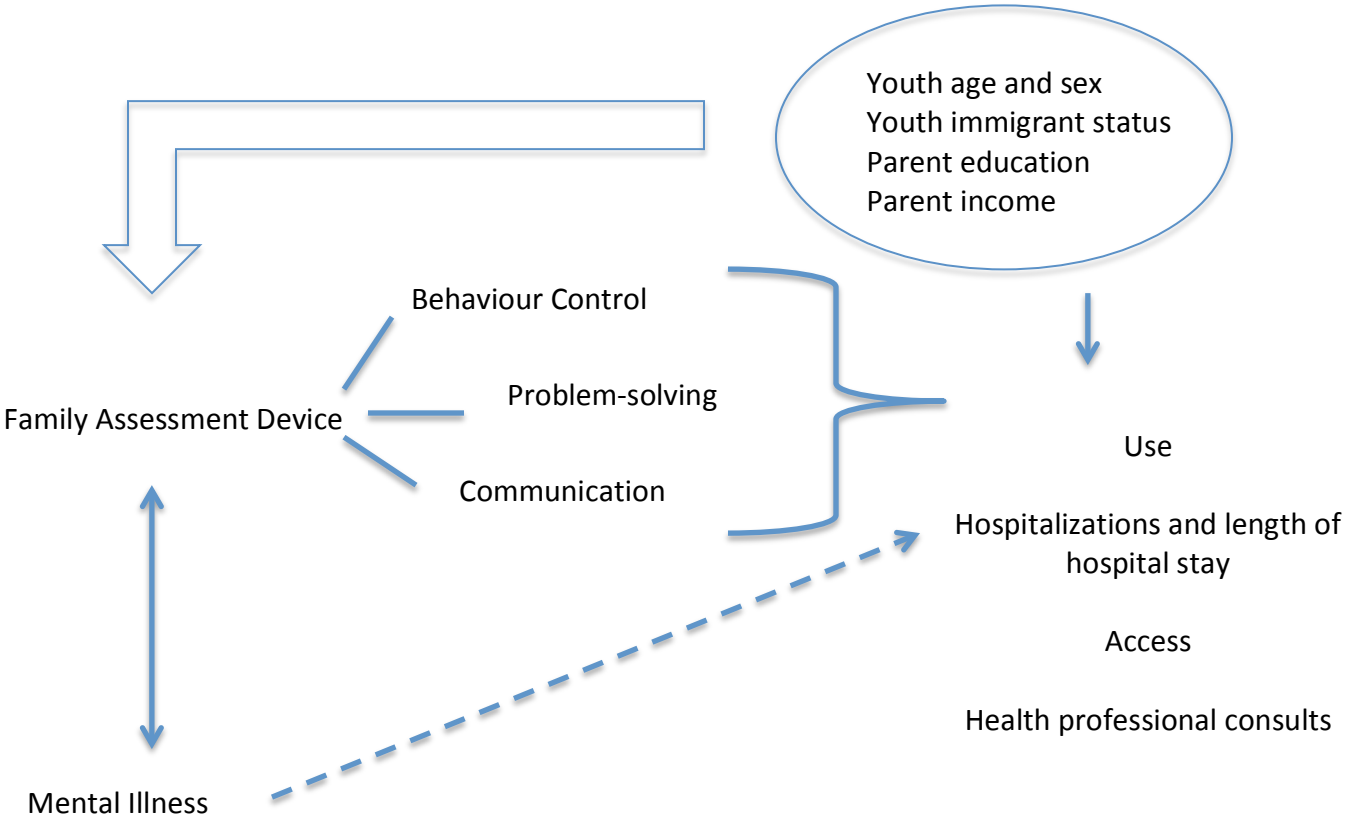

Figure 1. Using the Stress Process and Health Service Use models as a Guide to Conceptualize the Relationships between Family Functioning, Youth Mental Illness, and Mental Health Service Use and Access

CHAPTER 3: METHODOLOGY

3.1. Sample

One hundred parents and youth currently receiving mental health services from a tertiary care facility, McMaster Children's Hospital, were recruited in this cross-sectional study. Please refer to the appendix for information around primary to quaternary levels of care. The inclusion criteria were as follows: (1) youth were 4-17 years of age; (2) youth screened positive for at least one mental illness; and (3) youth received inpatient or outpatient mental health services. Parents were eligible to participate if they had sufficient English-language skills to complete the family functioning and mental health service use questionnaires. Youth that suffered from a psychotic episode or another mental health problem that interfered with their ability to complete the interview and questionnaires (i.e., schizophrenia) were excluded. Participants were removed from the analysis when: (1) parents did not complete the questionnaires and (2) there were missing data on the child-reported Mini International Neuropsychiatric Interview for Children and Adolescents for mental illness. The final analyzed sample contained 91 parents and youth.

3.2. Study Procedure

After consulting with the Charge nurse of the psychiatric inpatient unit, research staff described the study procedure to inpatient youth during treatment breaks. No children less than 8 years of age were recruited into the study. If interested, research staff obtained permission from youth to contact their parents to obtain oral consent for participation. The research staff scheduled times for parents and youth to complete the study questionnaires, which occurred when youth were discharged from the hospital or during visits to the hospital

by parents. Research staff obtained written consent from parents and youth aged 8-17 years prior to conducting the interviews and administering the questionnaires.

Clinic rosters were provided to research staff for recruitment of outpatient youth. The rosters contained the contact information of parents and youth that: (1) agreed to be contacted; (2) were currently receiving outpatient mental health services; and (3) were age-appropriate for inclusion in the study. Research staff contacted families over the phone, then introduced the study, and scheduled a time for parents and youth to complete the interview and questionnaires. Data collection occurred at the research office.

Responses to the interview and questionnaires were collected and stored electronically on laptops from parents and youth aged ≥8 years. Research staff obtained informed consent from each participant. Ethical approval for this study was obtained from the Hamilton Integrated Research and the University of Waterloo Research Ethics Boards.

3.3. Study Measures

McMaster Family Assessment Device

The General Functioning subscale of the McMaster Family Assessment Device (FAD) is a tool used to assess family functioning. Following a four-point Likert Scale (strongly agree to strongly disagree), parents were asked whether they agreed or disagreed to statements describing their family. Possible scores on the scale ranged from 0-36. Raw scores on the FAD were summed for a total score. Higher scores indicated better family functioning. The parent FAD in this study demonstrated acceptable internal consistency ($\alpha = 0.72$), which indicated the extent to which all of the items on the FAD consistently measured the same concept (family functioning) was adequate. The total FAD scores, specific items and item pairings that were

combined to create composite scores for problem solving, communication, roles, affective responsiveness, affective involvement, and behaviour control were included (Table 1).

Table 1. Six Domains of the Family Assessment Device (FAD) and Meanings

Domain	Item Pairings	Meanings
Problem Solving	FAD1 & FAD9	Problems making decisions and difficulty planning family activities.
Communication	FAD3 & FAD5	Inability to talk about sadness and avoiding discussing fears and concerns.
Behaviour Control	FAD7 & FAD11	Bad feelings in the family and not getting along well together.
Affective Involvement	FAD6 & FAD10	Expressing feelings to each other and making decisions on how to solve problems.
Affective Responsiveness	FAD4 & FAD8	Individuals being accepted for what they are and feeling accepted for what they are.
Roles	FAD2 & FAD12	Turning to each other in times of crisis and confiding in each other.

Mini International Neuropsychiatric Interview for Children and Adolescents

The Mini International Neuropsychiatric Interview for Children and Adolescents (MINI-KID) is a structured diagnostic interview used to screen children aged 6-17 years for mental illnesses according to the Diagnostic and Statistical Manual of Mental Disorders–IV and International Classifications of Diseases 10. It has been validated against the Schedule for Affective Disorders and Schizophrenia for School Aged Children-Present and Lifetime Version (73). The MINI-KID is made of diagnostic modules, which contain screening questions for each mental illness assessed. Common mental illnesses like youth-reported major depressive disorder (MDD), separation anxiety disorder (SAD), social phobia, specific phobia, generalized anxiety disorder (GAD), attention-deficit hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), and conduct disorder were included in this study (74). The youth-reported MINI-KID has demonstrated strong psychometric properties (75).

Mental Health Service Use and Access

This study used items from the Canadian Community Health Survey (Mental Health), which assesses mental health service use. Due to the nature of the dataset in this study, mental health service use was defined as hospitalizations and length of hospital stay while access referred to health professional consults (Table 2). The appendix contains additional information about the design of the Canadian Community Health Survey (Mental Health).

Table 2. Modified Version of the Mental Health Services Questions regarding Hospitalizations, Length of Hospital Stay, and Health Professional Consults from the Canadian Community Health Survey (Mental Health) in the Health of Youth Receiving Mental Health Services Study (76)

Hospitalization During the past 12 months, was your child hospitalized overnight or longer for problems with his/her emotions or mental health? **Number of Hospitalizations** During the past 12 months, how many times was your child hospitalized overnight or longer for these problems? **Length of Hospital Stay** How long did he/she stay in the hospital for these problems (during the past 12 months)? **Health Professional Consults** During the past 12 months, has your child seen, or talked on the telephone to any health professional about problems with his/her emotions or mental health?

Sociodemographic Characteristics

Information was collected from parents on child age at the time of MINI administration, child sex (male or female), parent sex (male or female), parent age, parent immigrant status (year of entry into Canada or not), marital status (married, common-law, widowed, divorced, separated, never married), education (some primary/elementary school, some high school, completed high school, completed vocational/technical training, completed college/university, completed graduate or professional school), and annual household income in $15,000 increments from <$15,000 to ≥$165,000.

CHAPTER 4: DATA ANALYSIS

4.1. Objective 1

Parent FAD total scores was treated as the continuous predictor variable while the presence of internalizing or externalizing illnesses was treated as the dichotomous outcome. Models were run separately for parent scores and youth-reported internalizing or externalizing illness while controlling for relevant confounders. Youth age, sex, parent income, and parent marital status have been identified as confounders in the association between family functioning and mental health (77). Odds ratios were computed from logistic (logit) regression with a binary outcome. The odds ratio (OR) was assessed to determine whether there was a positive (OR>1) or negative association (OR<1) between family functioning and youth-reported internalizing or externalizing illness. Confidence intervals (95%) were assessed to determine whether the true confidence parameter (OR = 1) fell within it and whether to reject or retain the null hypothesis. To detect chance differences, or falsely rejecting that there was no association between parent FAD total score and youth mental illness (i.e., type I error or false positive), $\alpha < 0.05$ was used along with two-sided hypothesis tests to account for higher or lower scores on the FAD and odds of mental illness.

4.2. Objective 2

Hospitalizations and past-year health professional consults were assessed using binary logistic (logit) regression for the discrete, binary outcome variables of “during the past 12 months, was your child hospitalized overnight or longer for problems with his/her emotions or mental health” and “during the past 12 months, has your child seen, or talked on the telephone to any health professional about problems with his/her emotions or mental health?” The predictor variable was parent FAD total scores. Potential confounders that could have skewed

the association between family functioning and mental health service use and access were: sex, past-year mental illness (78), age, income, and marital status (77) and were thus controlled for in the model.

Poisson logistic regression was used to investigate parent FAD scores on "during the past 12 months, how many times was he/she hospitalized overnight or longer for these problems?" which was treated as the count response variable. Poisson log linear regression was used for "how long did he/she stay in the hospital for these problems (during the past 12 months)?" with t representing days. Age is one confounder, which affects log length of hospital stay in youth with mental health needs (79) in addition to sex, income, and marital status (77). If the confidence interval for the estimate of parent FAD total scores did not include zero, then the null hypothesis was rejected and parent FAD scores were associated with mean number of times of hospitalization. The estimates determined whether every unit increase in parent FAD scores had an additive effect of $\exp(\beta)$ (quantity of that estimate) that was larger, smaller, or the same on the mean number of times of hospitalizations overnight or longer for emotional or mental problems in youth over the past 12 months given the other predictors in the model. The Poisson log linear regression estimates for parent FAD scores determined whether the difference in the logs of expected counts was expected to increase, decrease, or stay the same by the quantity of these estimates on the mean length of hospital stay in days for emotional or mental problems in youth, while holding the other predictors in the model constant. Deviance goodness of fit tests were also conducted.

4.3. Objective 3

Binary logistic regression was used to investigate parent problem solving, communication, roles, affective responsiveness, affective involvement, and behaviour control

on youth mental illness and mental health service use and access. Each item on the FAD belongs to the general functioning domain, yet these items also reflect aspects from the other six domains (80). Knowing this, a correlational matrix was conducted to determine which items were highly correlated to one another and consequently, to which domains they belonged. Models were then run separately for each domain containing their respective items. The second analysis involved creating composite domain variables, which combined the highly correlated items per domain by summing their respective scores. The subsequent models ran the composite domain variables together for each mental illness and mental health service use and access outcome. A factor analysis was also performed on the six FAD domains based on the pairings identified in the correlation analysis. After conducting the factor analysis, an assessment of model fit through a chi-square test, the root mean square error of approximation, the comparative fit index, and the Tucker-Lewis index was made. The predictor FAD items and composite variables were treated as continuous variables, given their ordinal nature (ranked from 0-3 corresponding to strongly agree to strongly disagree or vice versa depending on certain items that were reverse coded). The OR and 95% confidence intervals were consulted. The concordance statistic (c-statistic) measured the goodness of fit for each model and predicted youth mental illness and mental health service use and access by the FAD composite domains. A c-statistic value less than 0.5 was very poor, over 0.7 good, and values greater than 0.8 indicated strong model fit (81).

CHAPTER 5: RESULTS

5.1. Sample Characteristics

Characteristics of the study sample are shown in Tables 3 and 4. Briefly, youth had a mean age of 14.5 (SD 2.3) years and 70.3% were female. The majority of youth received outpatient services (59.3%). Phobia (social or specific) was the most common internalizing illness affecting 89.0 % of children. Less than half (47.3%) of children had oppositional defiant disorder, which was the most common externalizing illness. Parents had a mean age of 46.4 (SD 6.6) years and 84.6% of parents were female. Nearly half were married and 53.9% completed postsecondary education. Referring to Table 5., 44.0 % of parents responded that their child was hospitalized overnight or longer for emotional or mental health problems. The majority of parents (81.3 %) reported that their child had seen or talked to a health professional. Over half (64.9%) of parents reported that their child had been hospitalized one time. The average length of time spent in hospital for youth was 14.7 days. The average score on the FAD was 20.5 (SD 6.1).

Table 3. Characteristics of Youth

Characteristic	**n (%)**
Youth	
Age (years), mean (SD)	14.5 (2.3)
Female	64 (70.3)
Immigrant	4 (4.4)
Inpatient	37 (40.7)
Outpatient	54 (59.3)
Mental Illness	
Major depressive disorder	64 (70.3)
Separation anxiety disorder	26 (28.6)
Combined phobia (social or specific)	81 (89.0)
Generalized anxiety disorder	53 (58.2)
Any subtype ADHD	32 (35.2)
Conduct disorder	15 (16.5)
Oppositional defiant disorder	43 (47.3)

Table 4. Characteristics of Parents

Characteristic	**n (%)**
Age of youth (years), mean (SD)	14.5 (2.3)
Age of parents (years), mean (SD)	46.4 (6.6)
Female	77 (84.6)
Immigrant	10 (11.0)
Biological parents	82 (90.1)
Marital Status	
Married	45 (49.5)
Common-law	8 (8.8)
Widowed	4 (4.4)
Divorced	13 (14.3)
Separated	13 (14.3)
Never Married	8 (8.8)
Current Education Status	
Some high school	6 (6.6)
Completed high school	18 (19.8)
Completed vocational/technical training	8 (8.8)
Completed college/university	49 (53.9)
Completed graduate or professional school	10 (11.0)
Total Yearly Household Income (before taxes)	
Less than $ 15 000	4 (4.4)
$15-29 999	9 (9.9)
$30-44 999	10 (11.0)
$45-59 999	12 (13.2)
$60-74 999	11 (12.1)
$75-89 999	12 (13.2)
$90-104 999	12 (13.2)
$105-119 999	5 (5.5)
$120-134 999	3 (3.3)
$135-149 999	4 (4.4)
$150-164 999	2 (2.2)
$165 000 or greater	7 (7.7)
Parent FAD total score, mean (SD)	20.5 (6.1)

Table 5. Parent Responses to Hospitalizations, Length of Hospital Stay, and Health Professional Consults Questions

Question	n (%)
Parents respond, "Yes" to their child being hospitalized overnight or longer	40 (44)
Parents respond, "Yes" to their child seeing or talking to a health professional	74 (81.3)
Parents respond, "one time" to the number of times their child was hospitalized	24 (64.9)
Parents respond, "two times or more" to the number of times their child was hospitalized	13 (35.1)
Parents respond to average length of time in days in hospital	14.7 days

5.1.1. The Composite Domains of the McMaster FAD

After running a correlation matrix, we established that items one and nine reflected the problem-solving domain. A Pearson correlation coefficient (r) of -1 or +1 signifies a perfect linear relationship (82). Problems making decisions as a family and difficulty planning family activities were positively correlated (r= 0.45, p <0.0001) (Table 6). Items two and twelve represented the roles domain. Turning to each other in times of crises and confiding in each other correlated well (r= 0.74, p <0.0001). The communication domain was composed of items three and five. Inability to talk about sadness and avoiding discussions around fears and concerns were positively correlated (r=0.63, p< 0.0001). Items four and eight reflected affective responsiveness. Individuals being accepted for what they are correlated well with feeling accepted for what they are (r= 0.71, p< 0.0001). Behaviour control contained items seven and eleven. Bad feelings in the family were correlated with not getting along well together (r= 0.54, p< 0.0001). Lastly, affective involvement contained items six and ten. Expressing feelings to each other and making decisions on how to solve problems were correlated (r=0.47, p< 0.0001).

5.1.2. Factor Analysis from the Correlation Matrix

The results of the factor analysis for the above pairings are shown in Table 7. The chi-square test assesses the discrepancy between the sample and the fitted covariance matrix (83), which demonstrated good model fit ($p>0.05$). The Root Mean Square Error of Approximation (RMSEA) is a parsimony-adjusted index with values closer to 0 indicating good model fit (83), as supported by the zero estimate and 90% confidence interval [(0.00, 0.06)] in this study. The Comparative Fit Index (CFI) compares the fit of this proposed model to the fit of a null model. Because the CFI exceeded the cut-off of ≥.90 (CFI = 1) the model fitted the data well (83). A Tucker-Lewis Index (TLI) of 0.95 indicates that the proposed model improves the fit by 95% in comparison to the null model (83). Our proposed model demonstrated perfect fit (TLI =1). The next stage was to examine the binary logistic regression models for internalizing and externalizing illnesses.

Table 6. Correlation Matrix for the Item Pairings on the McMaster FAD

	FAD1	**FAD2**	**FAD3**	**FAD4**	**FAD5**	**FAD6**	**FAD7**	**FAD8**	**FAD9**	**FAD10**	**FAD11**	**FAD12**
FAD1	1.00	-0.15	0.32	-0.14	0.33	-0.07	0.37	-0.07	**0.45**	-0.04	0.38	-0.14
		0.15	0.002	0.19	0.001	0.48	0.0003	0.52	*<0.0001*	0.67	0.0002	0.19
FAD2	-0.15	1.00	-0.06	0.62	-0.12	0.69	-0.14	0.73	-0.07	0.59	-0.25	**0.74**
	0.15		0.54	<0.0001	0.25	<0.0001	0.19	<0.0001	0.53	<0.0001	0.01	*<0.0001*
FAD3	0.32	-0.06	1.00	-0.05	**0.63**	-0.11	0.31	-0.05	0.39	-0.09	0.28	-0.16
	0.002	0.54		0.66	*<0.0001*	0.31	0.003	0.61	0.0001	0.38	0.007	0.12
FAD4	-0.14	0.62	-0.05	1.00	-0.01	0.64	-0.14	**0.71**	-0.06	0.57	-0.12	0.52
	0.19	<0.0001	0.66		0.94	<0.0001	0.18	*<0.0001*	0.60	<0.0001	0.27	<0.0001
FAD5	0.33	-0.12	**0.63**	-0.01	1.00	0.04	0.23	-0.08	0.41	-0.10	0.35	-0.11
	0.001	0.25	<0.0001	0.94		0.69	0.03	0.47	<0.0001	0.33	0.001	0.31
FAD6	-0.07	0.69	-0.11	0.64	0.04	1.00	-0.11	0.62	-0.07	**0.47**	-0.12	0.61
	0.48	<0.0001	0.31	<0.0001	0.69		0.29	<0.0001	0.50	*<0.0001*	0.25	<0.0001
FAD7	0.37	-0.14	0.31	-0.14	0.23	-0.11	1.00	-0.23	0.50	-0.09	**0.54**	-0.25
	0.0003	0.19	0.003	0.18	0.03	0.29		0.03	<0.0001	0.39	*<0.0001*	0.02
FAD8	-0.07	0.73	-0.05	**0.71**	-0.08	0.62	-0.23	1.00	-0.06	0.65	-0.22	0.61
	0.52	<0.0001	0.61	<0.0001	0.50	<0.0001	0.03		0.58	<0.0001	0.03	<0.0001
FAD9	**0.45**	-0.07	0.39	-0.06	0.41	-0.07	0.50	-0.06	1.00	-0.04	0.43	-0.09
	<0.0001	0.53	0.0001	0.60	<0.0001	0.50	<0.0001	0.58		0.71	<0.0001	0.38
FAD10	-0.04	0.59	-0.09	0.57	-0.10	**0.47**	-0.09	0.65	-0.04	1.00	-0.14	0.57
	0.67	<0.0001	0.38	<0.0001	0.33	*<0.0001*	0.39	<0.0001	0.71		0.19	<0.0001
FAD11	0.38	-0.25	0.28	-0.12	0.35	-0.12	**0.54**	-0.22	0.43	-0.14	1.00	-0.26
	0.0002	0.01	0.01	0.27	0.001	0.25	*<0.0001*	0.03	<0.0001	0.19		0.01
FAD12	-0.14	**0.74**	-0.16	0.52	-0.11	0.61	-0.25	0.61	-0.09	0.57	-0.26	1.00
	0.19	*<0.0001*	0.12	<0.0001	0.31	<0.0001	0.02	<0.0001	0.38	<0.0001	0.01	

*The first number represents the Pearson-correlation coefficient (r). ** Correlations were statistically significant at p <0.0001.

Table 7. Results from the Factor Analysis of the Six Pairings Identified in the Correlation Matrix

Chi-Square Test of Model Fit	
Value	36.0
Degrees of Freedom (DF)	39
p-value	0.61
RMSEA	
Estimate	0.00
90% CI	(0.00, 0.06)
Probability RMSEA <= .05	0.89
CFI/TLI	
CFI	1.00
TLI	1.00

5.2. Objective 1

The binary logistic regression models for internalizing and externalizing illnesses began with unadjusted models for the exposure variable of parent FAD scores and the presence of mental illness. The use of binary models is appropriate when the outcome of interest is dichotomous (i.e., screening positive or negative for mental illness) and predictor variables are either discrete and/or continuous (84). Controlling for relevant confounders, higher parent FAD total scores (i.e., better family functioning) was associated with lower odds of MDD [OR= 0.88 (0.81, 0.97)](Table 8), SAD [OR= 0.91 (0.83, 1.00)] (Table 8), and ODD [OR= 0.91 (0.84, 0.99)] (Table 9). These findings demonstrated inverse relationships, the magnitudes of effects were close in proximity, and the effect sizes as well as upper ranges of the confidence intervals were also close to one. These interpretations indicate that the findings were nearly non-statistically significant. Further analysis was conducted to explore the relationships between family functioning, hospitalization, health professional consults, and length of hospital stay.

Table 8. Parent FAD Total Scores and Youth-reported Internalizing Illness

Internalizing Illness	Unadjusted OR and 95% CI	Adjusted OR and 95% CI
Major depressive disorder	0.89 (0.82, 0.96)	0.88 (0.81, 0.97)
Separation anxiety disorder	0.91 (0.83, 1.00)	0.91 (0.83, 1.00)
Any type of social phobia (i.e., generalized and non-generalized)	1.01 (0.94, 1.08)	1.04 (0.96, 1.13)
Specific phobia	1.06 (0.98, 1.14)	1.06 (0.98, 1.14)
Generalized anxiety disorder	0.96 (0.89, 1.02)	0.97 (0.89, 1.05)

Table 9. Parent FAD Total Scores and Youth-reported Externalizing Illness

Externalizing Illness	Unadjusted OR and 95% CI	Adjusted OR and 95% CI
ADHD	0.92 (0.83, 1.02)	0.92 (0.83, 1.02)
Conduct disorder	0.96 (0.87, 1.06)	0.95 (0.86, 1.05)
Oppositional defiant disorder	0.92 (0.85, 1.00)	0.91 (0.84, 0.99)

5.3. Objective 2

The binary logistic regression models of hospitalizations and health professional consults were initiated with unadjusted models for the exposure variable of parent FAD scores. After adjusting for relevant confounders, there were no statistically significant associations between higher parent FAD scores and hospitalizations or health professional consults (Tables 10 & 11).

The Poisson regression models of number of times of hospitalization and length of hospital stay also had the same exposure variable. The Poisson logistic regression procedure may be used when the dependent variable is an observed count (e.g., frequencies and length of time) (85). The predictor variables can be discrete and/or continuous while the values of the dependent variable are non-negative integers (85). In the adjusted models, there were no statistically significant associations between higher parent FAD scores and number of times of hospitalization or length of hospital stay (Tables 12 & 13). However, in the unadjusted model, higher parent FAD scores were associated with less stay in hospital in days [OR= 0.96 (0.94, 0.98)] (Table 13) although the sizes of the effect and upper range in the confidence interval

suggests near non-statistical significance. The next stage was to repeat the analyses using the same construct (i.e., family functioning) but with the domains of the FAD.

Table 10. Parent FAD Total Scores and Hospitalization of Youth for Emotional or Mental Health Problems in the past 12 months

Unadjusted OR and 95% CI	Adjusted OR and 95% CI
0.97 (0.90, 1.04)	0.99 (0.91, 1.08)

Table 11. Parent FAD Total Scores and Youth talking to or seeing any Health Care Professional for their Emotional or Mental Health Problems in the past 12 months

Unadjusted OR and 95% CI	Adjusted OR and 95% CI
1.03 (0.94, 1.13)	1.03 (0.93, 1.14)

Table 12. Parent FAD Total Scores and Number of Times of Hospitalization for Youth Emotional or Mental Health Problems in the past 12 months

Unadjusted OR and 95% CI	Adjusted OR and 95% CI
0.98 (0.93, 1.03)	0.99 (0.93, 1.04)

Table 13. Parent FAD Total Scores and Length of Hospital Stay of Youth

Unadjusted OR and 95% CI	Adjusted OR and 95% CI
0.96 (0.94, 0.98)	0.99 (0.97, 1.01)

5.4. Objective 3

Binary models of internalizing and externalizing illness, hospitalization, and health professionals consults were run with domains of the FAD. Poisson regression was used for number of times of hospitalization and length of hospital stay. Higher scores on affective involvement were associated with greater odds of MDD [(OR= 2.34 (1.09, 5.01)] (Table 14), GAD [OR= 2.34 (1.09, 5.01)] (Table 18), and greater stay in hospital [OR= 2.04 (1.76, 2.36)] (Table 25). Higher scores on behaviour control were associated with lower odds of SAD [OR= 0.60 (0.38, 0.96)](Table 15), any type of social phobia [OR= 0.50 (0.28, 0.88)](Table 16), ODD [OR=0.53 (0.33, 0.85)] (Table 21), and less stay in hospital [OR= 0.83 (0.76, 0.91)](Table 25). These findings demonstrate inverse relationships and the size of the effect is similar for any type of social phobia and ODD. The upper ranges in the confidence intervals for SAD (Table 15) and

hospital stay (Table 25) demonstrate that these findings are nearly non-statistically significant. Higher scores on problem solving were correlated with greater stay in hospital [OR=1.41 (1.24, 1.61)] (Table 25). Finally, higher scores on affective responsiveness and roles were correlated with less stay in hospital [OR= 0.76 (0.69, 0.84); OR= 0.70 (0.63, 0.78)] (Table 25).

5.4.1. Determining c-statistics using the Backwards Elimination Technique

A backwards elimination technique, which involved systematically removing each domain of the FAD from the full model, enabled us to determine the unique variance contributed by each domain. The c-statistics for the domains that produced the greatest decline in the overall c-statistic were included. In general, the effects were small across all outcomes for unadjusted (i.e., models with no confounders) and adjusted models (see footnotes in Tables 14-23). However, in the unadjusted GAD model with no confounders, communication resulted in a decrease of 0.15, and a worsening of model fit from good to poor (see footnote in Table 18).

Table 14. Odds of Youth-reported Major Depressive Disorder by Composite Domains (Combined Items)

Domains	**Unadjusted OR and 95% CI**	**Adjusted OR and 95% CI**
Problem solving	1.25 (0.79, 1.98)	1.31 (0.77, 2.24)
Communication	0.67 (0.44, 1.02)	0.80 (0.49, 1.31)
Behaviour control	0.83 (0.51, 1.35)	0.74 (0.41, 1.35)
Affective responsiveness	0.96 (0.60, 1.52)	0.87 (0.52, 1.47)
Affective involvement	1.88 (0.96, 3.68)	2.34 (1.09, 5.01)
Roles	0.92 (0.54, 1.57)	0.94 (0.52, 1.69)

The c-statistic for the model with the confounders excluded was 0.73 versus 0.70 after affective involvement was removed. The c-statistic for the model with the confounders included was 0.85 in comparison to 0.82 after eliminating affective involvement.

Table 15. Odds of Youth-reported Separation Anxiety Disorder by Composite Domains (Combined Items)

Domains	Unadjusted OR and 95% CI	Adjusted OR and 95% CI
Problem solving	1.34 (0.84, 2.13)	1.36 (0.86, 2.17)
Communication	1.12 (0.74, 1.69)	1.12 (0.74, 1.70)
Behaviour control	0.60 (0.38, 0.95)	0.60 (0.38, 0.96)
Affective responsiveness	0.83 (0.53, 1.30)	0.82 (0.52, 1.28)
Affective involvement	1.68 (0.88, 3.20)	1.78 (0.90, 3.51)
Roles	1.12 (0.67, 1.88)	1.11 (0.66, 1.88)

The c-statistic for the model with the confounders excluded was 0.74 versus 0.69 after behaviour control was removed. The c-statistic for the model with the confounders included was 0.74 in comparison to 0.70 when behaviour control was removed.

Table 16. Odds of any type of Youth-reported Social Phobia by Composite Domains (Combined Items)

Domains	Unadjusted OR and 95% CI	Adjusted OR and 95% CI
Problem solving	1.44 (0.95, 2.18)	1.65 (1.00, 2.75)
Communication	0.93 (0.65, 1.32)	1.11 (0.75, 1.65)
Behaviour control	0.64 (0.41, 1.00)	0.50 (0.28, 0.88)
Affective responsiveness	0.96 (0.65, 1.41)	0.91 (0.58, 1.44)
Affective involvement	1.20 (0.68, 2.10)	1.27 (0.66, 2.43)
Roles	0.78 (0.49, 1.23)	0.68 (0.40, 1.18)

The c-statistic for the model with the confounders excluded was 0.64 versus 0.58 after problem solving was removed. The c-statistic for the model with the confounders included was 0.81 versus 0.77 when either problem solving or behaviour control was eliminated.

Table 17. Odds of Youth-reported Specific Phobia by Composite Domains (Combined Items)

Domains	Unadjusted OR and 95% CI	Adjusted OR and 95% CI
Problem solving	1.14 (0.73, 1.78)	1.18 (0.74, 1.88)
Communication	0.91 (0.61, 1.36)	0.90 (0.58, 1.41)
Behaviour control	1.14 (0.73, 1.80)	1.23 (0.76, 1.98)
Affective responsiveness	0.87 (0.58, 1.31)	0.86 (0.56, 1.31)
Affective involvement	1.38 (0.77, 2.48)	1.47 (0.79, 2.73)
Roles	0.77 (0.47, 1.25)	0.76 (0.46, 1.25)

The c-statistic for the model with the confounders excluded was 0.64 versus 0.62 after either problems solving, communication, affective involvement, or roles was removed. The c-statistic for the model with the confounders included was 0.69 in comparison to 0.68 after either problem solving, communication, or behaviour control removed was removed.

Table 18. Odds of Youth-reported Generalized Anxiety Disorder by Composite Domains (Combined Items)

Domains	Unadjusted OR and 95% CI	Adjusted OR and 95% CI
Problem solving	1.39 (0.89, 2.15)	1.31 (0.77, 2.24)
Communication	0.48 (0.31, 0.74)	0.80 (0.49, 1.31)
Behaviour control	0.95 (0.62, 1.45)	0.74 (0.41, 1.35)
Affective responsiveness	0.84 (0.55, 1.27)	0.87 (0.52, 1.47)
Affective involvement	1.24 (0.68, 2.24)	2.34 (1.09, 5.01)
Roles	1.04 (0.64, 1.68)	0.94 (0.52, 1.69)

The c-statistic for the model with the confounders excluded was 0.73 versus 0.58 after communication was removed. The c-statistic for the model with the confounders included was 0.83 in comparison to 0.77 when communication was eliminated.

Table 19. Odds of Youth-reported Attention Deficit Hyperactivity Disorder (ADHD) by Composite Domains (Combined Items)

Domains	Unadjusted OR and 95% CI	Adjusted OR and 95% CI
Problem solving	1.11 (0.67, 1.84)	1.17 (0.70, 1.95)
Communication	0.91 (0.58, 1.44)	0.91 (0.57, 1.45)
Behaviour control	0.68 (0.42, 1.10)	0.62 (0.37, 1.04)
Affective responsiveness	1.05 (0.65, 1.69)	1.00 (0.61, 1.62)
Affective involvement	1.54 (0.75, 3.18)	1.74 (0.81, 3.76)
Roles	0.75 (0.42, 1.34)	0.72 (0.40, 1.31)

The c-statistic for the model with the confounders excluded was 0.67 in comparison to 0.64 after either behaviour control or affective involvement was removed. The c-statistic for the model with the confounders included was 0.71 versus 0.68 once behaviour control was removed.

Table 20. Odds of Youth-reported Conduct Disorder by Composite Domains (Combined Items)

Domains	Unadjusted OR and 95% CI	Adjusted OR and 95% CI
Problem solving	0.92 (0.56, 1.50)	0.79 (0.51, 1.24)
Communication	1.27 (0.80, 2.00)	1.17 (0.75, 1.83)
Behaviour control	0.74 (0.45, 1.22)	0.68 (0.40, 1.16)
Affective responsiveness	0.92 (0.55, 1.54)	0.89 (0.52, 1.52)
Affective involvement	1.40 (0.66, 2.97)	1.43 (0.66, 3.09)
Roles	0.87 (0.48, 1.61)	0.89 (0.47, 1.68)

The c-statistic for the model with the confounders excluded was 0.65 versus 0.61 once either communication or behaviour control was removed. The c-statistic for the model with the confounders included was 0.67 in comparison to 0.63 after communication was eliminated.

Table 21**.** Odds of Youth-reported Oppositional Defiant Disorder by Composite Domains (Combined Items)

Domains	**Unadjusted OR and 95% CI**	**Adjusted OR and 95% CI**
Problem solving	0.87 (0.57, 1.33)	0.88 (0.57, 1.35)
Communication	1.18 (0.81, 1.73)	1.16 (0.79, 1.73)
Behaviour control	0.55 (0.35, 0.86)	0.53 (0.33, 0.85)
Affective responsiveness	0.79 (0.53, 1.19)	0.80 (0.52, 1.21)
Affective involvement	1.59 (0.87, 2.94)	1.61 (0.85, 3.06)
Roles	0.92 (0.57, 1.48)	0.90 (0.55, 1.47)

The c-statistic for the model with the confounders excluded was 0.74 in comparison to 0.66 when behaviour control was removed. The c-statistic for the model with the confounders included was 0.75 versus 0.67 after behaviour control was eliminated.

There were no statistically significant associations between higher scores on any of the FAD domains and odds of hospitalizations or health professional consults (Tables 24 & 25). Issues with statistical power such as having a strict statistical significance criterion and smaller sample size may have prevented us from detecting these effects. The final stage was to examine the number of times of hospitalization and length of hospital stay using Poisson regression.

Table 22. Odds of Hospitalization as reported by Parents by Composite Domains (Combined Items)

Domains	Unadjusted OR and 95% CI	Adjusted OR and 95% CI
Problem solving	0.98 (0.66, 1.46)	0.80 (0.47, 1.35)
Communication	0.80 (0.56, 1.15)	0.96 (0.60, 1.54)
Behaviour control	0.85 (0.57, 1.27)	0.77 (0.47, 1.26)
Affective responsiveness	0.90 (0.62, 1.31)	0.76 (0.43, 1.33)
Affective involvement	1.31 (0.76, 2.27)	1.43 (0.69, 2.96)
Roles	0.83 (0.53, 1.30)	0.79 (0.43, 1.46)

The c-statistic for the model with the confounders excluded was 0.63 versus 0.60 after communication was removed. The c-statistic for the model with the confounders included was 0.83 in comparison to 0.82 after either communication, behaviour control, affective responsiveness, affective involvement, or roles was eliminated.

Table 23. Odds of Health Professional Consults as reported by Parents by Composite Domains (Combined Items)

Domains	Unadjusted OR and 95% CI	Adjusted OR and 95% CI
Problem solving	1.00 (0.61, 1.66)	0.68 (0.34, 1.36)
Communication	0.79 (0.51, 1.23)	1.23 (0.61, 2.47)
Behaviour control	0.94 (0.55, 1.58)	0.95 (0.52, 1.75)
Affective responsiveness	0.96 (0.58, 1.58)	0.76 (0.40, 1.44)
Affective involvement	0.92 (0.45, 1.85)	0.82 (0.37, 1.79)
Roles	0.84 (0.47, 1.51)	1.23 (0.60, 2.51)

The c-statistic for the model with the confounders excluded was 0.70 in comparison to 0.66 once communication was removed. The c-statistic for the model with the confounders included was 0.73 versus 0.71 after communication was eliminated.

Neither the unadjusted nor the adjusted Poisson regression models demonstrated statistically significant associations between the domains of the FAD and number of times of hospitalization (Table 26).

Table 24. Odds of Hospitalization Times as reported by Parents by Composite Domains (Combined Items)

Domains	Unadjusted OR and 95% CI	Adjusted OR and 95% CI
Problem solving	0.90 (0.69, 1.17)	0.89 (0.66, 1.21)
Communication	0.94 (0.73, 1.21)	0.92 (0.68, 1.25)
Behaviour control	1.02 (0.83, 1.27)	1.09 (0.84, 1.40)
Affective responsiveness	1.02 (0.83, 1.25)	0.96 (0.75, 1.24)
Affective involvement	1.01 (0.69, 1.47)	1.04 (0.69, 1.55)
Roles	1.01 (0.78, 1.32)	1.03 (0.79, 1.36)

Table 25. Odds of Length of Hospital Stay as reported by Parents by Composite Domains (Combined Items)

Domains	Unadjusted OR and 95% CI	Adjusted OR and 95% CI
Problem solving	1.50 (1.34, 1.67)	1.41 (1.24, 1.61)
Communication	0.70 (0.63, 0.77)	0.88 (0.77, 1.01)
Behaviour control	0.88 (0.83, 0.94)	0.83 (0.76, 0.91)
Affective responsiveness	0.93 (0.86, 1.00)	0.76 (0.69, 0.84)
Affective involvement	1.78 (1.55, 2.03)	2.04 (1.76, 2.36)
Roles	0.70 (0.64, 0.77)	0.70 (0.63, 0.78)

CHAPTER 6: DISCUSSION

6.1. Objective 1-Better Family Functioning and Youth Mental Illness

Better family functioning (i.e., higher parent FAD total scores) was associated with lower odds of MDD, SAD, and ODD, which supports our initial hypothesis.

Parents of children with MDD may recognize that their child is more socially withdrawn and isolated and desire to follow-up with them more frequently. In doing so, they make an effort to establish good interpersonal dynamics, which may lend them to perceive their family functioning as improving, and thus, better. This continual connection with their child may alleviate the perceptions of feeling alone, sad, and empty in the child, which are prevalent symptoms in persons with MDD (86).

In contrast, the symptoms of MDD in the child may negatively affect family functioning, as perceived by parents. Wang et al. hypothesized that participants with internalizing illness may be less inclined to share information about their feelings with their family members and this lack of sharing may contribute to interpersonal strain in the family, worse communication, and poorer perceived family functioning (87). Considering better family functioning was protective in our study, family functioning strategies that foster better interpersonal dynamics could be integrated into current clinical practice to assist families of children with MDD.

With respect to caring for a child with SAD, parents may provide greater attention and support for their child when they are experiencing highly stressful moments (i.e., being away from home or loved ones). In fact, children felt more encouraged and less anxious when their parents give them extra attention and guidance in anxious and socially uncomfortable situations (88). Therefore, better family functioning as characterized by more attentiveness,

support, encouragement, and guidance, creates a more comfortable environment for children, which could demonstrate protective effects against child anxiety (88).

Despite this, Ehrenreich et al. demonstrated how raising a child with separation anxiety may act as a stressor, negatively influencing parent-perceived family functioning (89). Parents may experience elevated stress and poorer quality of life when their child with SAD struggles to follow instructions, cannot overcome anxious situations, and when they must alter their lifestyle to accommodate the needs of their child (89). Specifically, parents may sleep more regularly with their child, monitor their behaviour more frequently, and spend less quality time with other family members (89). Hence, the presence of child SAD may act as a stressor worsening parent-perceived family functioning. However, if parents are supportive and encouraging, these parental traits may help protect from child anxiety. Knowing this, health professionals could educate parents around methods of improving family functioning to reduce the likelihood of SAD in children.

Lastly, parents who have accessed parent management training may have more success in managing the behavioural symptoms of their children with externalizing illness, such as ODD. In particular, children with externalizing illness are less likely to engage in problematic behaviour when parents engage in positive play strategies, make fewer demands, explain instructions thoroughly, demonstrate patience after giving instructions, speak at a slow pace without engaging in conflict, praise to reinforce positive behaviour, and implement time outs (90), which are strategies emphasized during this training. Parents who have implemented these strategies of managing their child with ODD may witness improvements in their behaviour. Thus, parents may be more inclined to report better family functioning in our study.

Unfortunately, we do not know if parents received training for managing their child with externalizing illness prior to beginning our study or during the study itself, which could be a limitation.

Alternatively, prior research attests that mothers of children with ODD tend to report poorer family functioning than mothers of children without ODD (91) perhaps due to greater feelings of hostility, anxiousness, and less effectiveness in managing their children compared to families without a child with externalizing illness (92). Because we found that better family functioning was associated with lower odds of ODD, we recommend that health professionals encourage family-level interventions, like that of parent management training.

The school environment could affect the ability for youth to recognize mental health problems and subsequently access and use mental health services. Specifically, a positive school environment, as characterized by connectedness to teachers, parents, and schoolmates, was associated with greater odds of mental health literacy and less stigma among students (93). A positive school environment might enable youth to acknowledge their mental health concerns and communicate these issues to their peers or teachers. Consequently, these individuals might encourage services within the school or community, which could lead to youth accessing mental health support sooner to prevent unnecessary hospitalization and hospital stay (93).

Other aspects such as neighbourhood resources, presence of adverse childhood experiences, parental mental health, and ethnicity can also shape youth mental health problems and service use. In particular, fewer neighbourhood resources like libraries, community centres, and parks were associated with anxiety and depression in youth (94). There

was also a dose response relationship observed among the number of adverse childhood experiences (e.g., abuse, neglect etc.) and youth mental illness (94). Having a parent with mental health problems or with a history of mental illness also places children at risk for developing mental health concerns. The risk may be high for children because of limited parent-child contact, poor communication, abusive family environments, lack of emotional support, and genetic predisposition to mental illness (94). Finally, being Hispanic, black, and multiracial may be associated with lower odds of mental illness and service use and access (94). Individuals with these characteristics could have a strong social support network within their family, and display solidarity, which may protect from feelings of deprivation in their neighbourhood and mental illness (94). However, some Black and Hispanic individuals are less likely to access and use mental health services due to stigma around mental health care in ethnic minority women, less availability of mental health services, and greater unmet needs, particularly among Latino youth (94).

6.2. Objective 2-Better Family Functioning, Hospitalizations, and Health Professional Consults

There were no statistically significant associations between parent FAD scores, all six composite domains of the FAD, hospitalizations of youth, or consults. These findings do not support the hypothesis. Because all of the youth in our sample were receiving mental health services either through inpatient or outpatient clinics, our sample lacked heterogeneity. Having a homogenous sample may minimize the presence of variation, which could impact whether we detect statistically significant associations. Moreover, the majority of our sample received outpatient services rather than inpatient services, which usually requires overnight hospitalization (95). Thus, an association with hospitalization may have been masked by a sample of predominately participants using outpatient services. Due to a relatively small

sample size, there may have been limited power to detect significant associations pertaining to parent-reported hospitalizations and consults for youth. Having a less stringent criterion for statistical significance (i.e., an alpha of 0.10 instead of 0.05) may have enabled these associations to be detected by widening the area of acceptance of the alternative hypothesis.

This being said, there may legitimately be no associations between better family functioning and outcomes of mental health service use and access within samples of children receiving clinical services. In fact, one study noted no significant differences on the FAD among families whose children received a liver transplantation versus nonclinical families (96).

However, when assessing family dysfunction in children with mental health problems, Verhulst found that family dysfunction (i.e., higher scores on the general functioning subscale of the FAD) was associated with 3.0 greater odds of parent-reported mental health referral for specialized mental health services in children and youth (97). Given this relationship, we would anticipate that better family functioning could promote improved familial relationships and perhaps postpone the need to refer for mental health services. Conversely, better family functioning could imply that parents are more involved in the health care of their child and prefer that they seek support as soon as possible, which may make parents more inclined to refer for mental health services. Moreover, when maladaptive behaviours in the child are perceived to contribute to family stress and affect coping abilities, families may be more inclined to seek psychiatric professional consultation and the likelihood of hospitalization increases (98).

6.3. Objective 3-Higher Scores on the FAD Domains and Youth Mental Illness

Higher scores on affective involvement were associated with greater odds of MDD, which is a surprising finding and does not support our original hypothesis. We speculate that

parents who are overly involved may interfere with the ability of the child to make independent decisions, which could impact how indecisive these children feel. In fact, parental interference may adversely affect the ability of their child to develop self-confidence, autonomy, and decision-making skills, which could contribute to internalizing symptoms (99). Indecisiveness nearly every day, as perceived by children or their parents, is a symptom of major depressive disorder (86). Furthermore, if parents perceive that their child has a reduced ability to think or concentrate, a characteristic symptom of MDD (86), they may continue making decisions for them, which reinforces the dependency of the child on their parents. Consequently, parents may continue acting overly involved and display sustained or excessive interest (e.g., express their feelings) during the activities of their child (100). Thus, parental over-involvement may affect the perception of decision-making skills at the level of the child, which could contribute to their feelings of indecisiveness, and consequently, this particular symptom of MDD.

On the other hand, parents with a child that has emotional symptoms may become over-involved as a means to relax their child in situations of distress (99). Doing so may calm their child, make them feel more comfortable, and perhaps alleviate some MDD-associated symptoms such as feelings of worthlessness or inappropriate guilt (86). Contrastingly, parental over-involvement could reinforce emotional behaviour since they are making decisions for their child, which could impact the ability of their child to overcome conflict independently, and consequently their internalizing symptoms (99).

Scoring high on affective involvement does not imply better family functioning in our sample. Ideally, we believe that there should be a balance in affective involvement within families. However, we cannot yet identify the threshold where it becomes helpful or harmful.

Knowing this, future research should strive to examine affective involvement on the FAD and its impact on the presence of emotional symptoms in internalizing illnesses like MDD.

Higher scores on behaviour control were associated with lower odds of SAD and any type of social phobia (i.e., social or specific). These findings align with our hypothesis. Behaviour control is the degree to which a family displays certain behavioural standards amidst different scenarios (e.g., social) (101). It is also concerned with parental control and management styles (e.g., flexible versus rigid) (101). If parents enable children to develop their own behaviour in social settings (i.e., exert less authority over how they decide to interact and promote greater flexibility in social situations), this could possibly encourage their child to develop social skills autonomously. Parents may then perceive that their child is assimilating well in social environments, including in the home, and believe that family members are getting along well together, which could be indicative of good feelings in the family. Thus, having the child develop skills independently could improve their sense of self and confidence (88) in situations when they are separated from family members or during specific social situations.

However, the opposite may occur when parents prevent their child from engaging in social experiences or interfere with their independence. Their child may be unable to form their own social skills since this practice is discouraged by their parents (88). Moreover, the child may perceive having a sense of independence as wrong, and may associate independence with guilt, fear, or anxiety (88), which are symptoms of social anxiety disorders (102). Therefore, health professionals could communicate the role of parental behaviour control strategies in social situations for children with social and separation anxiety disorders.

Higher scores on behaviour control were associated with lower odds of ODD, a finding that supports our hypothesis. It is possible that parents reported higher scores on behaviour control because they desire to monitor the behaviour of their child using disciplinary methods that have been proven to be evidence-based and effective. These methods may have helped parents manage the argumentative, vindictive, and defiant behaviour of their child in the past making them feel more effective at managing their child with externalizing symptoms (92) and less critical at the time of our study. Thus, they may have felt more inclined to report higher scores on family functioning, particularly on the behaviour control domain, because they perceive that their child with ODD is getting along well in the family and that there are more good feelings. In other words, the methods employed by parents in disciplining their child with ODD matters. Children with externalizing illness are more likely to engage in desired behaviour when parents use praise to reinforce positive behaviour, make fewer coercive demands, and implement time outs (90).

A previous study found that mothers of children were more likely to discipline their children using negative solutions (e.g., commands) and demonstrated higher control over the behaviour of their child than mothers of children with ADHD (91). Moreover, being an authoritarian parent, which could be characterized as displaying excessive parental control (103), was associated with symptoms of externalizing illnesses (104). Therefore, parents could be consulted on the optimal disciplinary methods for managing the behaviour of their child with ODD to emphasize better behaviour control (e.g., how to get along well together).

6.3.1. Higher Scores on the FAD Domains and Length of Hospital Stay

Higher scores on behaviour control, affective responsiveness, and roles were associated with less stay in hospital, which aligns with our hypothesis (albeit communication was not

associated). There is a paucity of research examining each domain of the FAD using length of hospital stay as the outcome in clinical samples of children with mental illness. Other studies also use varying measures of family functioning (79,105,106).

Despite this, we propose that children who have a more profound relationship with their parents in terms of feeling accepted, feeling like they can confide, and getting along well in their family might feel more comfortable communicating their mental health problems with their parents. Better communication, stronger bonds, and lack of conflict between children and their parents have been associated with decreased lengths of hospital stay (79). Moreover, Better functioning families are more inclined to actively participate in the treatment decision making for children, a factor that could reduce length of hospital stay (105).Therefore, parents of children with mental illness that experience better family functioning, may desire that their child accesses mental health care treatment for their illness as soon as possible where specialist services are typically located (i.e., in the hospital). Health professionals can thus intervene earlier during the trajectory of the mental illness to promote quicker recovery, which could enable the child to be discharged earlier. However, an alternative explanation for less stay in hospital among children with mental illness might be that the inpatient unit within the hospital is not the most appropriate setting to treat their mental illness given the trajectory, personality, and experiences of the child. Health professionals may refer them to settings that facilitate outpatient services instead. Children and families may prefer outpatient services where nurses visit them in their homes rather than receiving care in hospital. Therefore, better and comprehensive screening should take place during the mental health trajectory of children in

and before reaching the hospital. This would aid in promoting optimal treatment strategies unique to the condition and experience of the child.

Culture is also an important factor that can affect hospital stay. If mental health problems are not openly acknowledged within the culture of the family, this may interfere with time to admittance into hospital and lengthen hospital stay (107). Having a child with comorbid mental and physical conditions (e.g., bipolar disorder and arterial hypertension) (108) can also lengthen hospital stay (108,109). Since it may be more difficult to intervene on a cultural level to reduce hospital stay and mental illnesses are frequently comorbid (110), health professionals could instead focus on family functioning for all families to foster better behaviour control, affective responsiveness, and roles. Promoting acceptance, the ability to confide, and getting along well may enable children to receive mental health support from specialists earlier, and potentially reduce hospital stay.

Higher scores on problem solving and affective involvement contributed to greater stay in hospital, which is contrary to our hypothesis. Higher scores on affective involvement could indicate that parents are overly involved (i.e., express their feelings and make frequent decisions for their child), which their child may perceive as controlling (100). Their child may feel less eager to express concerns around their mental health to their controlling parents. Furthermore, parents may not be aware of the mental health condition of their child until they start demonstrating symptoms, which could elevate stress in parents and children. In fact, when there is elevated levels of parental stress, parents may be less able or willing to participate in the mental health care of their child, which is a factor associated with extended stay in hospital (105). In addition, parents may rely on receiving care in hospital as the optimal

solution for assisting their child with mental illness instead of focusing on combined or alternative treatment strategies within the community and/or integrating the child back at home with support from hospital staff. In fact, parents might request that health professionals offer more treatment and allocate greater time towards their child in hospital because they believe making these recommendations is indicative of good parenting (111).

Along the same vein, when parents report that they do not have problems making decisions or difficulty planning family activities, it may be because they are making all of the decisions on behalf of their child, which discourages independent problem solving. Moreover, children may feel overwhelmed to make decisions with parents who do not encourage it (99), and this may prevent them from overcoming challenging obstacles and adapting to unrecognizable situations that require some level of problem solving. Inhibiting independent decision making around problem solving is associated with the presence of anxiety in children (99). Because having a mental illness such as anxiety is a risk factor for hospital stay (108), children who come from families that inhibit problem solving may not adapt well to stressful experiences (e.g., mental illness), which could affect the level of conflict during interactions with family members. Conflict in the family is another factor associated with longer stay in hospital (105).

Aside from family-level determinants, having serious or severe co-morbid mental illness is yet another factor that can lengthen hospital stay (112). The definition of a severe mental illness is not well defined in clinical practice but may be broadly described as a mental, behavioural, or emotional illness, most notably illnesses like psychosis, that may cause pain and suffering, affect individual daily functioning, and require treatment for two years or more (113).

Hence, it may not only be the behaviour and actions of the parents that interferes with hospital stay. Rather, the severity and complications associated with the child's condition may require further treatment, assistance, and clinical documentation by hospital staff, which has the potential of lengthening hospital stay (112). Furthermore, we may see a longer length of stay in hospital for children with mental illness because the child may not be ready for discharge to return home given their condition or an appropriate discharge location (e.g., for quaternary care) is lacking.

Alternatively, we speculate that overly involved parents and parents who solve problems in all aspects of their child's life, may feel that it is their responsibility to follow-up, ensure that their child is receiving the best treatment methods, and engage in discussions with the care provider of the child (114). Throughout the care process, parents may become more competent and exert more control over the health care of their child (114). In doing so, they may receive greater support from staff because there is ongoing open communication and dialogue (114) around active treatment decision-making (115). Finally, we speculate that parents may want their child to access mental health support for as long as needed because they recognize that receiving help in hospital is best for their child. Consequently, they may want their child to remain in hospital without being discharged too early. We encourage health professionals to communicate to parents that a balance in affective involvement and problem solving would be beneficial because too much of either may have detrimental effects (i.e., lengthen unnecessary hospital stay) for their child.

CHAPTER 7: APPLICATION TO THEORETICAL FRAMEWORKS

7.1. Pearlin's Stress Process and Andersen's Health Service Use Theoretical Frameworks

Findings align with certain components of these theoretical frameworks (i.e., primary stressors and stress outcomes like mental illness). According to the Stress Process Model, primary stressors refer to the presence of mental illness itself or family dysfunction, which can lead to the development of mental illness (66). We were unable to discern if family functioning led to the development of mental illness, our stress outcome, or vice versa because these factors were measured at the same time. Moreover, youth needed to have screened positive for at least one mental illness for inclusion into the study. However, we determined that higher FAD total scores were associated with lower odds of MDD, SAD, and ODD while better behaviour control was correlated with reduced odds of SAD, social phobia, and ODD. In contrast, higher scores on affective involvement were correlated with greater odds of MDD. Therefore, there is evidence to demonstrate that elements of family dysfunction, such as higher scores on affective involvement, act as primary stressors, which may have a role to play in the presence of MDD. We were also able to capture the social context of the parenting situation by assessing youth age, sex, parent education, income, and immigrant status. However, mediators like coping and social support and secondary stressors such as changes in lifestyle and threats to self-esteem were not measured during the data collection process. Thus, our findings cannot speak to these particular variables.

The aim of the Health Service Use model is to illustrate the impact of exposure variables (e.g., family functioning) on health service use (70) while outlining the kinds of services youth receive at certain locations as well as the purpose and time associated with receiving them. To re-iterate, youth received either inpatient or outpatient services from McMaster Children's

Hospital from 2015 to 2017. The aim was to improve their mental health (e.g., alleviate symptoms, teach coping skills in novel situations etc.). The outcomes of interest unique to this theoretical model were: hospitalization, consults, and length of hospital stay. There were no statistically significant findings for parent FAD scores or any of the domains on mental health service use (i.e., hospitalization) and access (i.e., consults) in particular. Interestingly, relationships existed between domains of family functioning and length of hospital stay. Specifically, higher scores on behaviour control, affective responsiveness, and roles were correlated with less stay in hospital as opposed to higher scores on problem solving and affective involvement, which were associated with greater stay in hospital.

According to this model, cultural norms, or shared beliefs (71), may affect the uptake of mental health services used. Within this study, the role of culture, parent perception of mental health, stigma, difficulties understanding the mental health system, and lack of experience managing previous mental health problems were not examined. Thus, these variables were missing from the service use model. Culture plays a role in shaping parents' social perception of mental health problems and need for specialists services for youth (97). If families prioritize the mental health care of the child and do not express stigmatized attitudes towards mental health services, they may be more inclined to refer their child for treatment (116). Conversely, factors that may interfere with mental health service use in youth include parents' unfamiliarity with navigating the mental health system and/or their prior experience of managing mental health issues without professional support (116). White families were predominately represented in this study. Hence, perceptions regarding the seriousness of mental health issues and access of

services could have varied among these families, which could have encouraged or interfered with mental health services used or accessed within the past year.

Predictors of mental health service access, specifically health professional consults, include: being male, perceiving oneself as having better physical health, and experiencing emotional issues, panic disorder, or social phobia (78). Social support in the community is also a primary determinant for health care service access (e.g., women who have a stronger sense of community are more inclined to seek help) (78). Therefore, informal support received at the family and neighbourhood level might affect whether families actively seek care for their child with mental health problems. We speculate that tailoring mental health support that focuses on family functioning to individuals with the broad characteristics mentioned above within the community, could improve mental health outcomes at a macroscopic level.

This study underrepresented immigrants, few parents had incomes below the poverty line of $44 266 per household after-tax income (117), the minority only completed high school, and only a few parents were separated or divorced. Therefore, families of certain minority groups (e.g., Latin American, Arab, and Indigenous families), those with lower levels of education and income, and separated or divorced families were not captured to the fullest extent.

Despite the lack of variability in sociodemographic characteristics in the sample, previous studies have demonstrated the impact of marital conflict in increasing children's symptoms of emotional distress (58), the role of family cohesion in improving problem-solving skills in Latino families (67), and the impact of level of education on mental health service use among persons with depression or anxiety (118).

In fact, one study determined that persons with depression or anxiety without a high school education did not access mental health services as often in comparison to persons who had completed high school (118). Education is associated with mental health literacy (i.e., recognition of symptoms of mental illness and treatment). Persons with lower levels of education may also be less inclined to communicate their emotional problems (118).

Alternatively, formal support provided by primary care physicians might impact who is referred for mental health specialist care. In fact, some primary care physicians may believe that clients with low mental health literacy and poor communication could not benefit from mental health services like counselling and are less inclined to recommend this service or refer them to further support persons. (118). In general, we speculate that deterrents to accessing mental health services among persons with mental illness could be feelings of stigmatization, lack of awareness of services available, and insufficient mental health care coverage (e.g., for psychologists) through employment, especially since mental health services are not covered under the Ontario Health Insurance Plan (OHIP) (119).

CHAPTER 8: LIMITATIONS

There are a few limitations related to this study. Families were recruited from a paediatric hospital that may not be representative of all families of children living with mental illness. Because certain mental illnesses were not captured (e.g., schizophrenia, bipolar disorder etc.), these findings cannot be generalized to families of children with varying types of internalizing or externalizing illnesses. Moreover, this study did not assess all parental experiences of family functioning external to the sample obtained.

There was limited heterogeneity because immigrant families (e.g., Arab, indigenous, and Latin American) were underrepresented. This prevented an analysis into the impact of culture on service use. However, given that culture could be recognized as an important family-level determinant, it should be considered in future studies.

Using a secondary dataset posed some challenges. Certain variables (e.g., coping and social supports, threats to self-esteem etc.) could not be measured since they were not assessed from the onset of the study. Despite this, there are many advantages with using secondary data including convenience and affordability (120). Assessing health professional consults, hospitalizations, and length of hospital stay within the past year also does not reflect current and cannot predict future use and access of health services. Thus, findings should not be interpreted in this manner.

Lastly, we do not know if parents received training for managing their child with externalizing illness prior to beginning our study or during the study itself, which may have impacted the association between better family functioning and lower odds of ODD.

In other work, using the same informant may lead to an overestimation in the correlation between predictors and outcomes (121). This study employed a shared method

variance approach, which can be described as the covariance between two variables (i.e., parent-perceived family functioning and youth mental illness) that may not be explained by the construct of interest (i.e., family functioning) but shares the same method of measuring the variable (i.e., self-report) (122). Because parent reports were used to measure family functioning and youth reports for mental illness, the correlations for family functioning and mental illness could be attenuated across two informants.

CHAPTER 9: IMPLICATIONS FOR CLINICAL AND BEHAVIOURAL INTERVENTIONS

For people with depression, anxiety, substance use disorders and a wide spectrum of other mental illnesses, primary care physicians are the first points of contact (123). However, primary care physicians face difficulties in meeting the demands of persons with complex mental health and addiction needs. They often do not have the resources available to assess or diagnose mental health problems and/or may be unfamiliar with the changing mental health services provided (123). Clients experience fragmented care because of gaps in communication among primary care physicians, mental health specialists, and other parts of the mental health care system (123).

In recognizing these barriers, it is apparent that primary care physicians require support in understanding the services that exist for persons with mental health problems. Since family-focused interventions have demonstrated improved mental health outcomes (124), we propose that primary care physicians recommend family-based interventions when deciding on mental health support for their clients. Moreover, because poor family functioning can place individuals at risk for adverse mental illness outcomes (125), we encourage that primary care physicians communicate the role of family functioning on mental health when they interact with their clients and/or forward their clients to health professionals that facilitate family functioning strategies within the context of family-centred care.

At sites where family-centred strategies are currently employed, such as at McMaster Children's Hospital (126) and The Hospital for Sick Children (127), health professionals can promote better family functioning strategies and begin to make changes to how they target and deliver quality care, which could improve family dynamics. Mental health specialists at these

hospitals and others could facilitate family-centred interventions that foster better family functioning, by targeting specific domains for improvement unique to each family.

Delivering targeted family-centred care may create benefits for families and the health care system. These tailored family-centred care strategies could promote better family functioning within families. In doing so, we speculate that there may be less strain on the Canadian health care system required to treat youth with mental illness because there is a stronger foundation in the family environment. In fact, when there is greater communication and less stress and conflict in the family environment, parents may take more initiative in the mental health care of their child, which is associated with reduced time in hospital (79,105). Hence, saved funds from spending less time in hospital could be diverted to other clinical priorities, with the potential of improving health system efficiency. Despite the potential benefits to the health care system, we recognize that children may still develop a mental illness regardless of tailored family-centred care strategies. Health professionals should thus prioritize including families in the treatment of their child during tertiary level of care.

Families should be involved in the mental health care of their child because they have the capacity to impact their social and mental progress throughout their lives (11). Families have a significant impact on the daily decisions children make, their perception of the world around them, their ability to adapt to adverse situations, methods of communication in times of family conflict, and numerous other essential life skills required as children transition into adulthood. Therefore, when delivering mental health care, it is crucial to incorporate both parent and child perspectives because family influences are intertwined with the development of child social and mental skills.

In particular, families exposed to family-centred care strategies are involved in defining their “family” in a manner that applies to their family situation. They also actively participate in care and decision-making surrounding child mental health with their health care professional. Moreover, families plan, deliver, and evaluate the quality of their mental health care. Throughout the facilitation of these strategies, families recognize that they can collaborate with health professionals to ensure that they listen and respect the family’s knowledge, values, and beliefs (128).

Evidence-based behavioural interventions that target the family environment are as effective as cognitive behavioural therapy resulting in improved youth and parent mental health outcomes (124,129). Some of these behavioural interventions include: family-based group treatments for anxiety disorders, family therapy for youth with anorexia nervosa, functional or multidimensional family therapy in the treatment of youth substance use disorders, and the Family Talk preventative intervention for parents with depression (124,130). Our study findings complement these interventions because they focus on aspects of family functioning like communication and behaviour. Thus, we recommend that health professionals facilitating these and similar family-focused interventions continue to promote better family functioning strategies. The aim would be to improve the quality of family relationships and mental health outcomes for families in Ontario.

CHAPTER 10: IMPLICATIONS FOR PUBLIC HEALTH INTERVENTIONS AND FUTURE COLLABORATIONS

Health professionals can take an integrated knowledge translation approach to mental health, similar to that of the Family Help program (131). Family Help facilitates early evidence-based mental health interventions for families within their homes, which are focused on preventing mental illnesses and their severity (131). Families are educated on child mental health through handbooks, telephone calls with a problem-solving coach, and weekly videos. The lessons taught within the Family Help modules have shown effectiveness in clinical trials (131). With respect to public health approaches, this program implemented advertisements and posters in physician offices, circulated advertisements to family doctors, community organizations, schools, online, and on the radio. The researchers found that the most effective knowledge translation strategies included a combination of engaging with families in the community and advertisements in newspapers, radio, and television to help raise awareness about the program (131).

Given the effectiveness of evidence-based mental health interventions within Family Help, researchers could integrate a module focused on family functioning strategies in order to educate parents around the potential impact of family functioning on child mental health in families across Ontario. Researchers could use similar knowledge translation techniques (i.e., diverse media channels and community outreach) to promote awareness of family functioning within the Family Help program.

As a more upstream approach, increased focus on family-centred care strategies during prenatal education could be essential in educating new parents around the impact of family functioning on child mental health. The effects of prenatal education on parents are

inconclusive due to inconsistencies in methodologies and populations observed (132). However, prenatal education has been associated with the initiation of breastfeeding among certain groups (e.g., black urban women). Prenatal education is also demonstrated to be effective in modifying hygiene practices to prevent parasitic infections (132). Although the effectiveness of prenatal classes is uncertain (132), it should not be discounted as a potential means to raise awareness about specific topics, such as family functioning strategies to better inform new families.

Mental health organizations and frameworks affiliated with Child Mental Health and Youth Services in Ontario, such as the Family Association for Mental Health Everywhere (133) and Parents for Children's Mental Health (134) are just some examples that promote meaningful participation within families during processes and activities surrounding mental illness. Specifically, the Family Connections Program, which is evidence and community based, offers support and education to persons who are in a relationship with someone that is experiencing emotional symptoms and internalizing illness (135). Although the focus is not explicitly on children with various types of mental illnesses, this program does offer family functioning training based on family skills, group support, and individual coping skills with a central focus on involving family members (135). In the future, if the program were to extend to families of children with internalizing and externalizing mental illness, then findings around the domains of family functioning could be applied and professionals facilitating this program could recommend better family functioning strategies.

The Parents for Children's Mental Health framework is developed from the evidence informed family engagement model, which consulted literature and health professionals in

Ontario and facilitated interviews with family informants (136). This program oversees mental health agencies, organizations, and initiatives by ensuring that their activities are relevant to family experiences and follow evidence-based family engagement practice (136). Hence, integrating knowledge of better family functioning strategies into this existing framework complements the guiding principles of family engagement and could aid in optimizing mental health outcomes for children and families. We propose that if the family is the cause of stress for youth, specialists in organizations under the Parents for Children's Mental Health framework could offer techniques to youth over the phone or online to help manage a difficult family environment and improve mental health.

To ensure that children and youth with mental health problems reach the most appropriate care facility, integrated and comprehensive assessment tools like those proposed by the Child and Youth Mental Health and Adolescent Supplement, which are pioneered by interRAI, can continue to be applied across multiple components of the health system for youth of different ages (137). The varying screening tools evaluate psychiatric, social, functioning, resiliency, environmental, and family-based aspects to assess needs of children and youth. These tools are supported by evidence-informed Collaborative Action Plans that identify risk and provide suggestions for interventions by clinicians (137). They are ideal tools because they function in an integrated manner. In other words, the child/youth tools use algorithms and technical approaches that are consistent for individuals, can follow children and youth across the health system as they age, target upstream needs to allow for coordinated services, and streamline these services in other aspects of the health system as well (137).

Investing in parent training within schools (91) could also act as a broad and effective intervention. Combined interventions in schools that focus on problem solving and strengthening families have shown improvements across dimensions associated with youth substance abuse (e.g., school bonding, family relationships, parenting capabilities etc.) versus controls (138). Hence, involvement from the MOE to formulate similar interventions focused on strengthening the family environment could be optimal in educating parents about better family functioning strategies. Parents and teachers can collaborate to discuss strategies during parent-teacher meetings for managing a child that shows early signs of internalizing or externalizing symptoms, brainstorm solutions to improve family functioning, and provide access to mental health resources (i.e., flyers, relevant websites, etc.).

Throughout this process, teachers should be cognisant of the roles culture and language play when providing support to families. The support provided should be communicated in a manner that families will understand the main messages and which acknowledges and respects their cultural values.

The MOHLTC and/or the MCCSS can also continue to fund mental health resources for organizations and agencies in the community, with a particular focus on helping families of children with internalizing and externalizing mental illness that are exposed to various family functioning environments. Twelve studies in a systematic review found that home and community-based mental health treatment were associated with improved mental health outcomes in older adults (139). Furthermore, parents reported fewer instances of management problems in children at risk for behavioural disorders within a community-based group (140).

The aim of channelling these resources into the community with a focus on family functioning would be to optimize mental health outcomes for families of children with mental illness.

Currently at the policy level, there are completed standards of care within Ontario for major depression (22) and ongoing standards for obsessive-compulsive disorder and anxiety disorders (141,142). Within the standards of care for depression, there is a focus on involving the family (i.e., family self-care and resiliency) during education around depression and community supports and crisis services (22). However, this form of family education is a modality of treatment whereas family-centred care strategies are evidence-based (143). Moreover, it is possible that mental health professionals are facilitating neither family education nor family-centred care strategies despite family education being a current regulation. Thus, collaborating with Health Quality Ontario is necessary to develop an infrastructure for ensuring mental health professionals' implement the existing regulations and facilitate them both effectively and ethically.

CHAPTER 11: SUGGESTIONS FOR FUTURE RESEARCH

Greater data should be generated regarding family functioning, particularly each domain of the FAD, and service use and access. More data around this topic can help guide researchers in determining if their findings support or refute prior work as well as to inform future intervention strategies. Similarly, further research is required that codes measures of family functioning consistently (i.e., in the same direction along the same scale), to enable direct comparisons of better family functioning across differing samples (i.e., youth versus adults). Furthermore, studies should explore the relationship between higher scores on affective involvement, mental illness, and service use to identify a threshold, which differentiates helpful from harmful affective involvement scores. Lastly, this research should be replicated to focus on family functioning using the McMaster FAD, mental illness, and service use and/or access among families in the broader population, especially those from diverse sociodemographic backgrounds.

CHAPTER 12: CONCLUSION

Better family functioning was correlated with lower odds of internalizing and externalizing mental illnesses. Higher scores on affective involvement were associated with increased odds of internalizing illnesses and greater stay in hospital, whereas higher scores on problem solving were only correlated with greater stay in hospital. Higher scores on behaviour control were associated with lower odds of internalizing and externalizing illnesses as well as less stay in hospital. Similarly, higher scores on affective responsiveness and roles were associated with less stay in hospital. In light of these findings, health resources can be directed towards ameliorating the mental health outcomes of families and children with internalizing and externalizing illnesses as well as for children within the broader population. Additionally, health professionals could be encouraged to address family functioning by tailoring support depending on how families score across the domains (i.e., promote better family functioning to meet the unique needs of each family). The delivery of targeted care in the context of family-centred care strategies could optimize mental health outcomes for children and their families. Subsequently, investment into mental health approaches directed towards the family environment could ideally produce desirable outcomes for the health system into the future.

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APPENDIX

Appendix A: Levels of Care in The Healthcare System For Persons with Mental Illness

Persons with mental illness can enter the health care system through primary, secondary, tertiary, and quaternary points of contact. Primary care is the first-level of entry into the system. Persons who are mentally unwell may visit their family physician's office, nurse practitioner's office, community health centre, or nursing station. After providing support and advice to promote positive mental health to the person, the doctor or nurse practitioner may refer them to a secondary care service, which is provided by mental health professionals that have not had first contact with the person. Secondary care services include outpatient/ambulatory care, some limited specialized and rehabilitation services. This study delivered a combination of secondary (outpatient) and tertiary care services at a teaching facility, which offers specialized mental health care for inpatients, through referral from a primary or secondary care provider (144).

Appendix B: Design and Data Collection in the Canadian Community Health Survey (Mental Health) (CCHS-MH)

The Canadian Community Health Survey (Mental Health) (CCHS-MH) was used to assess mental health service use. Mental health service use could be defined as lengths of hospital stay, hospitalizations, or access to past-year mental health professional consults (145). The CCHS-MH was a sample survey with a cross-sectional design (145). It included questions regarding factors leading to good mental health, the extent and impact of mental illness in Canada, access to and use of formal and informal mental health services and supports, and perceived and unmet needs for these services and supports (146). Specifically, the Mental Health Services (SR1) module was of interest since information was collected about the respondent's use of help, and health care services related to problems with emotions or mental health during the past 12 months (76). The variables that were of interest included access to and use of formal mental health services and supports (145).

The collection method for the CCHS-MH was by personal interview. It was a voluntary questionnaire delivered by a trained interviewer. The questions were designed for computer-assisted interviewing (CAI), where the type of answer required, the minimum and maximum values, on-line edits for questions, and situations of item non-response, was specified (145). This questionnaire was generalizable since reliable estimates were required across each province across four age groups (15-24, 25-44, 45-64 and 65+ years) and sex (145). People living on reserves and other Aboriginal settlements, full-time members of the Canadian Forces, and the institutionalised population were excluded. Data were collected during January 2nd 2012 to December 31st 2012. A total of 25 113 valid interviews were conducted (145).

Appendix C. Statistical Notation

Binary Logistic Regression Model to Investigate Family Functioning (FAD scores) on Youth Mental Illness

Model Notation.

For a dichotomous outcome, we use the following generalized linear model (GLM), given by

$$\eta_i=\beta_0+\beta_1 X_{1i}+\cdots+\beta_k X_{ki};\ i=1,\ldots,n$$

Where

$\eta_i=logit(\Pr(Y_i=1))$ = log $(\frac{\Pr(Y_i=1)}{1-\Pr(Y_i=1)})$ is the log-odds of Y_i= 1 for subject i;

$X_{1i},\ldots,X_{ki}$ are (fixed) k explanatory variables for subject *i*;
$\beta_1,\ldots,\beta_k$ are the (fixed) unknown regression coefficients for each of the predictors.

Objective 2. Model 1.

For simplicity, only select models have been included to illustrate that the outcomes

change to different internalizing or externalizing illnesses for parent scores.

$$\eta_i=\beta_0+\beta_1\text{Parent FAD Total Scores}_i+\beta_2\text{Youth Sex}_i+\beta_3\text{Youth age}_i+\beta_4\text{ Parent Income}_i+\beta_5\text{ Parent Marital Status}_i;\ i=1,\ldots,n$$

Where

$\eta_i=logit(\Pr(Y_i=1))$ = log $(\frac{\Pr(Y_i=\text{have major depressive disorder})}{1-\Pr(Y_i=\text{have major depressive disorder})})$ is the log-odds of Y_i= have major depressive disorder and $1-\Pr(Y_i=\text{have major depressive disorder})$ meaning, does not have major depressive disorder for subject i;
Parent FAD Total Scores$_i$ + Youth Sex$_i$ + Youth age$_i$ + Parent Income$_i$ + Parent Marital Status$_i$ are (fixed) k explanatory variables for subject *i*;
$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are the (fixed) unknown regression coefficients for each of the predictors.

Objective 2. Model 2.

$$\eta_i=\beta_0+\beta_1\text{Parent FAD Total Scores}_i+\beta_2\text{Youth Sex}_i+\beta_3\text{Youth age}_i+\beta_4\text{ Parent Income}_i+\beta_5\text{ Parent Marital Status}_i;\ i=1,\ldots,n$$

Where

$\eta_i=logit(\Pr(Y_i=1))$ = log $(\frac{\Pr(Y_i=\text{have combined ADHD})}{1-\Pr(Y_i=\text{have combined ADHD})})$ is the log-odds of Y_i= have combined ADHD and $1-\Pr(Y_i=\text{have combined ADHD})$ meaning, does not have combined ADHD for subject i;

Parent FAD Total Scores$_i$+ Youth Sex$_i$ + Youth age$_i$ + Parent Income$_i$ + Parent Marital Status$_i$ are (fixed) k explanatory variables for subject i;

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are the (fixed) unknown regression coefficients for each of the predictors.

Binary Logistic Regression Model to Investigate Family Functioning (FAD scores) on Hospitalizations and Access to Any Health Professional

Objective 3. Part A. Model 3.

Note that only a few models have been included.

$\eta_i=\beta_0+\beta_1$Parent FAD Total Scores$_i$+ β_2Youth Sex$_i$ + β_3Youth age$_i$ + β_4 Parent Income$_i$ + β_5 Parent Marital Status$_i$ + β_6 Any past-year study-specific externalizing illness$_i$; i=1,…,n

Where

$\eta_i=logit(\Pr(Y_i=1))$ = log $\left(\frac{\Pr(Y_i=\text{youth has been hospitalized in the past 12 months})}{1-\Pr(Y_i=\text{youth has been hospitalized in the past 12 months})}\right)$ is the log-odds of Y_i= youth has been hospitalized in the past 12 months and $1-\Pr(Y_i=\text{youth has been hospitalized in the past 12 months})$ meaning, has not been hospitalized in the past 12 months for subject i;

Parent FAD Total Scores$_i$ + Youth Sex$_i$ + Youth age$_i$ + Parent Income$_i$ + Parent Marital Status$_i$ + Any past-year study-specific externalizing illness$_i$ are (fixed) k explanatory variables for subject i;

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are the (fixed) unknown regression coefficients for each of the predictors.

Note: Externalizing illnesses are being controlled for rather than internalizing illnesses. 87% (n = 79) of participants screened positive for at least one internalizing mental illness, with the possibility of there being co-morbid conditions.

Objective 3. Part A. Model 4.

$\eta_i=\beta_0+\beta_1$Parent FAD Total Scores$_i$+ β_2Youth Sex$_i$ + β_3Youth age$_i$ + β_4 Parent Income$_i$ + β_5 Parent Marital Status$_i$ + β_6 Any past-year study-specific externalizing illness$_i$; i=1,…,n

Where

$\eta_i=logit(\Pr(Y_i=1))$ = log $\left(\frac{\Pr(Y_i=\text{youth has talked to or seen any health professional in the past 12 months})}{1-\Pr(Y_i=\text{youth has talked to or seen any health professional in the past 12 months})}\right)$ is the log-odds of Y_i= youth has talked to or seen any health professional in the past 12 months and $1-\Pr(Y_i=$ youth has talked to or seen any health professional in the past 12 months$)$ meaning, youth has not talked to or seen any health professional in the past 12 months for subject i;

Parent FAD Total Scores$_i$+ Youth Sex$_i$ + Youth age$_i$ + Parent Income$_i$ + Parent Marital Status$_i$ +

Any past-year study-specific externalizing illness$_i$ are (fixed) k explanatory variables for subject *i*;
$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are the (fixed) unknown regression coefficients for each of the predictors.

Poisson Regression Model Notation.

GLM Model for Counts (147) to Investigate Family functioning (FAD scores) on Number of Times of Hospitalizations

Model Notation**.** We use the following generalized linear model for counts (GLM), given by

$$g(\mu) = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \cdots + \beta_p X_{ip}$$

Random component: Response Y has a Poisson distribution that is Y_i*~Poisson* (μ_i) for *i*=1,…,*n* where the expected count of Y_i is $E(Y) = \mu$ *(the expected value or mean of Y is* μ)
Systematic component: Any set of X = (X_{i1}, X_{i2},…X_{ip}) are explanatory variables.
Natural log link: $\log(\mu) = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} \ldots + \beta_p X_{ip}$
Therefore, with multiple explanatory variables, we write:

$$\log(\mu_i) = \beta_0 + \beta_1 X_{i1} + \cdots + \beta_p X_{ip}$$

Or

$$\mu = e^{(\beta_0 + \beta_1 X_{i1} + \cdots + \beta_p X_{ip})}$$

Objective 3 Part B. Model 5.

$\log(\mu_i)$ = β_0 + β_1Parent FAD Total Scores$_i$ + β_2Youth sex$_i$ + β_3Youth age$_i$ + β_4Parent income$_i$ + β_5 Parent marital status$_i$ + β_6Any past-year study-specific externalizing illness$_i$

Where
The expected value or mean of Y (number of times youth was hospitalized overnight or longer for emotional or mental problems in the past 12 months) is μ
β_0 = y-intercept
Parent Total FAD Scores$_i$+ Youth sex$_i$ + Youth age$_i$ + Parent income$_i$ + Parent marital status$_i$ + Any past-year study-specific externalizing illness$_i$ are (fixed) k explanatory variables for subject *i*;
$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are the (fixed) unknown regression coefficients for each of the predictors. Note: The same notation is used by substituting Parent Total FAD Scores with the Composite Domains of the FAD, for the Poisson regression models in objective 4.

Domains of the FAD, for the Poisson regression models in objective 4.

Poisson Log linear Regression Model Notation.

GLM Model for Rates (147) to Investigate Family Functioning (FAD scores) on Length of Hospital Stay in Days

Model Notation**.** We use the following generalized linear model for rates (GLM), given by

$$g(\mu) = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \cdots + \beta_p X_{ip}$$

Random component*:* Response Y has a Poisson distribution, and t is index of the time or space; more specifically the expected value of rate $\frac{Y}{t}$, is E $(\frac{Y}{t}) = \frac{\mu}{t}$.
Systematic component*:* Any set of $X = (X_{i1}, X_{i2}, \ldots X_{ip})$ are explanatory variables.
Log of rate link: $\log(Y/t)$
Therefore, with multiple explanatory variables, the Poisson log linear regression model for the expected rate of the occurrence of event becomes:

$$\log(\mu_i) = \beta_0 + \beta_1 X_{i1} + \cdots + \beta_p X_{ip} + log\ (t)$$

Or

$$\mu = \exp\big(\beta_0 + \beta_1 X_{i1} + \cdots + \beta_p X_{ip} + log(t)\big) = (t)\exp(\beta_0)\exp\left(\beta_1 X_{i1} + \cdots + \beta_p X_{ip}\right)$$

Objective 3 Part B. Model 6.

$\log(\mu_i)$= β_0 + β_1Parent FAD Total Scores$_i$ + β_2Youth sex$_i$ + β_3Youth age$_i$ + β_4 Parent income$_i$ + β_5 Parent marital status$_i$ + β_6Any past-year study-specific externalizing illness$_i$ + log (days)

Where

The expected value or mean of Y (length of stay in days in hospital for emotional or mental problems overnight or longer in the last 12 months) is μ
$\beta_0 =$ y-intercept
$t =$ Time in days
exp(β_0) effect on the mean of Y, that is μ, when X =0
exp(β) = the difference in the logs of expected counts is expected to increase, decrease, or stay the same by the quantity of these estimates on length of hospital stay for emotional or mental problems by youth in days, while holding the other predictors in the model constant
Parent FAD Total Scores$_i$ + Youth Sex$_i$ + Youth age$_i$ + Parent income$_i$ + Parent marital status$_i$ + Any past-year study-specific externalizing illness$_i$ are (fixed) k explanatory variables for subject *i*; $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are the (fixed) unknown regression coefficients for each of the predictors.

Binary Logistic Regression Model to Investigate the Six Domains of the FAD and Youth Mental Illness

Model Notation.

For a dichotomous outcome, we use the following generalized linear model (GLM), given by

$$\eta_i=\beta_0+\beta_1 X_{1_i}+\cdots+\beta_k X_{ki};\ i=1,\ldots,n$$

Where

$\eta_i=logit(\Pr(Y_i=1))$ = log $(\frac{\Pr(Y_i=1)}{1-\Pr(Y_i=1)})$ is the log-odds of Y_i= 1 for subject i;
$X_{1i},\ldots,X_{ki}$ are (fixed) k _explanatory variables for subject i;
$\beta_1,\ldots,\beta_k$ are the (fixed) unknown regression coefficients for each of the predictors.

Objective 4. Model 7.

Note that for subsequent models investigating mental illness, the outcomes change to each internalizing or externalizing illness studied for composite parent problem solving, communication, roles, affective responsiveness, affective involvement and behaviour control domains listed in table 1.

$$\eta_i=\beta_0+\beta_1\text{Composite domains of the FAD}_i+\beta_2\text{Youth age}_i+\beta_3\text{ Youth sex}_i+\beta_4\text{Parent income}_i+\beta_5\text{Parent marital status}_i;\ i=1,\ldots,n$$

Where

$\eta_i=logit$ $(\Pr(Y_i=1))$ = log $(\frac{\Pr(Y_i=\text{ have major depressive disorder})}{1-\Pr(Y_i=\text{have major depressive disorder})})$ is the log-odds of Y_i= youth has major depressive disorder and $1-\Pr(Y_i=\text{has major depressive disorder})$ meaning, youth does not have major depressive disorder for subject i;
Composite domains of the FAD$_i$+ Youth age$_i$ + Youth sex$_i$ + Parent income$_i$ + Parent marital status$_i$ are (fixed) k explanatory variables for subject i;
$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are the (fixed) unknown regression coefficients for each of the predictors.

Binary Logistic Regression Model to Investigate the Six Domains of the FAD and Mental Health Service Use

Model Notation.

For a dichotomous outcome, we use the following generalized linear model (GLM), given by

$$\eta_i=\beta_0+\beta_1 X_{1_i}+\cdots+\beta_k X_{ki};\ i=1,\ldots,n$$

Where

$\eta_i = logit(\Pr(Y_i=1)) = \log\left(\frac{\Pr(Y_i=1)}{1-\Pr(Y_i=1)}\right)$ is the log-odds of $Y_i = 1$ for subject i;
$X_{1i},\ldots,X_{ki}$ are (fixed) k explanatory variables for subject i;
$\beta_1,\ldots,\beta_k$ are the (fixed) unknown regression coefficients for each of the predictors.

Objective 4. Model 8.

Note that for subsequent models investigating mental health service use, the outcome remains the same but the predictors change to reflect the six domains of the FAD.

$\eta_i = \beta_0 + \beta_1$Composite domains of the FAD$_i$ + β_2Youth Sex$_i$ + β_3Youth age$_i$ + β_4 Parent Income$_i$ + β_5 Parent Marital Status$_i$ + β_6 Any past-year study-specific externalizing illness$_i$; $i=1,\ldots,n$

Where

$\eta_i = logit(\Pr(Y_i=1)) = \log\left(\frac{\Pr(Y_i = \text{youth has been hospitalized in the past 12 months})}{1-\Pr(Y_i = \text{youth has been hospitalized in the past 12 months})}\right)$ is the log-odds of Y_i= youth has been hospitalized in the past 12 months and $1 - \Pr(Y_i = \text{youth has been hospitalized in the past 12 months})$ meaning, has not been hospitalized in the past 12 months for subject i;
Composite domains of the FAD$_i$ + Youth Sex$_i$ + Youth age$_i$ + Parent Income$_i$ + Parent Marital Status$_i$ + Any past-year study-specific externalizing illness$_i$ are (fixed) k explanatory variables for subject i;
$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are the (fixed) unknown regression coefficients for each of the predictors.

Binary Logistic Regression Model to investigate the Six Domains of the FAD and Mental Health Service Access

Model Notation.

Note that for subsequent models investigating mental health service access, the outcome remains the same but the predictors change to reflect the six domains of the FAD.

For a dichotomous outcome, we use the following generalized linear model (GLM), given by

$$\eta_i = \beta_0 + \beta_1 X_{1_i} + \cdots + \beta_k X_{ki};\ i=1,\ldots,n$$

Where

$\eta_i = logit(\Pr(Y_i=1)) = \log\left(\frac{\Pr(Y_i=1)}{1-\Pr(Y_i=1)}\right)$ is the log-odds of $Y_i = 1$ for subject i;
$X_{1i},\ldots,X_{ki}$ are (fixed) k _explanatory variables for subject i;
$\beta_1,\ldots,\beta_k$ are the (fixed) unknown regression coefficients for each of the predictors.

η_i=β_0+β_1Composite domains of the FAD$_i$ + β_2Youth Sex$_i$ + β_3Youth age$_i$ + β_4 Parent Income$_i$ + β_5 Parent Marital Status$_i$ + β_6 Any past-year study-specific externalizing illness$_i$; i=1,…,n

Where

η_i=$logit$(Pr(Y_i=1)) = log $\left(\frac{\Pr(Y_i = \text{youth has talked to or seen any health professional in the past 12 months})}{1-\Pr(Y_i = \text{youth has talked to or seen any health professional in the past 12 months})}\right)$ is the log-odds of Y_i= youth has talked to or seen any health professional in the past 12 months and $1 - \Pr(Y_i = \text{youth has talked to or seen any health professional in the past 12 months})$ meaning, youth has not talked to or seen any health professional in the past 12 months for subject i;

Composite domains of the FAD$_i$+ Youth Sex$_i$ + Youth age$_i$ + Parent Income$_i$ + Parent Marital Status$_i$ + Any past-year study-specific externalizing illness$_i$ are (fixed) k explanatory variables for subject i;

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are the fixed) unknown regression coefficients for each of the predictors.