PEDIATRIC PSYCHOSOCIAL EVALUATION IN THE EMERGENCY DEPARTMENT

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Abstract

The American Academy of Pediatrics has prioritized standardizing psychosocial evaluation and screening interventions in the emergency department, to improve the detection and care of youth with identified or unrecognized mental health issues. Few standardized tools exist covering a range of issues and are designed and psychometrically evaluated for use in the emergency department. A digital evidence-based, clinically-informed youth psychosocial assessment and disposition guidance tool (HEARTSMSAP) was developed, addressing this need. A preliminary evaluation found the tool to have good predictive validity and interrater reliability among pediatric emergency clinicians. This research aimed to expand the use of the clinical HEARTSMAP tool beyond strictly the pediatric emergency clinician population, through two connected but separate investigations. In study one, HEARTSMAP's interrater reliability was evaluated among different emergency clinician-types, working in diverse emergency settings (n=16). Clinicians displayed moderate to near-perfect interrater scoring agreement in applying HEARTSMAP to fictional vignettes, with weighted kappas on tool sections ranging from 0.46 (Professionals & resources; 95% CI: 0.40, 0.46) to 0.93 (Alcohol & drugs; 95% CI: 0.93-0.94). Study two was a multi-phase, multi-method study to adapt the clinical tool into a lay selfadministered version for youth and families. First, focus groups were conducted in a communitybased sample of youth and parents (n=38), to inform tool modification. Feedback focused on the need for MyHEARTSMAP to be approachable and interpretable for end-users, and evidence was found supporting the tool's content and face validity. Second, community-based youth and parents applied the latest MyHEARTSMAP version to fictional vignettes. Participants reliably scored psychosocial issues using MyHEARTSMAP, displaying substantial to near-perfect interrater agreement on tool sections, with weighted kappas ranging from 0.76 (Professionals & resources; 95% CI: 0.73, 0.79) to 0.98 (Alcohol & drugs; 95% CI: 0.97-0.98). Together, these

studies suggest that clinician- and self-administered psychosocial evaluation can be consistently conducted by diverse emergency clinicians, youth, and parents. Ongoing evaluations will assess HEARTSMAP's impact on ED patient flow (e.g., length of stay, rate of return visit, rate of hospitalization), and MyHEARTSMAP's interrater reliability and validity among emergency department visiting youth and families, in predicting ED disposition (discharge or admission) and clinician's service referrals.

Lay summary

Many young people with mental health issues struggle to find proper mental health support in the community, so they arrive at the emergency department (ED) with or without a crisis, to connected with more specialized care. To ensure these youth receive equal care in the ED, we tested how reliably different types of clinicians, coming from different kinds of EDs (e.g., urban, rural) could assess mental health issues. Since many mental health problems go undetected until symptoms heighten, we conducted to focus groups to develop a self-screening tool youth and parents could self-screen with. We found that different ED clinicians could reliably score mental health issues, and the self-screening tool was acceptable and reliably used to score mental health issues by youth and parents. In summary, the ED may be well situated for standardized mental health assessment by different clinicians and screening youth and parents can do on their own.

Preface

All studies were approved by the University of British Columbia's Children's and Women's Research Ethics Board (H15-02249, H16-00876).

Study one is outlined in Chapter 2. A version of this work was published in the *Pediatric* & *Child Health*, available online: [https://doi.org/10.1093/pch/pxy017]. The citation is as follows: [Virk, P., Stenstrom, R., & Doan, Q. (2018). Reliability testing of the HEARTSMAP psychosocial assessment tool for multidisciplinary use and in diverse emergency settings. *Paediatrics & Child Health*]. Drs. Q. Doan and R. Stenstrom are both co-authors on this manuscript. Under Dr. Q. Doan's supervision, I was responsible for (i) organizing and analyzing data, and (ii) composing the manuscript.

Study two is outlined in Chapter 3. A version of this work is being prepared for submission to the *Paediatrics & Child Health* journal. Drs. Q. Doan, S. Laskin, R. Gokiert, C. Richardson, A. Newton, R. Stenstrom, and B. Wright were all co-authors and offered critical review during manuscript preparation. Under Dr. Q. Doan's supervision, I was responsible for (i) designing and conducting the study, (ii) collecting and analyzing data, and (iii) composing the manuscript

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Dedication

To my mom, dad, and brother

Chapter 1: Introduction

- 1.0 Background
- 1.1 The youth mental health crisis
- 1.1.1 Epidemiology

Mental health conditions affect one in four individuals worldwide. Often emerging in childhood and adolescence,¹ these concerns form a major contributor to health-related disability and disease burden in the youth population.² A systematic review of 41 global epidemiological studies on child and adolescent mental health conducted in 23 countries between 1985-2012, reported a pooled prevalence of 13.4% (95% CI: 11.3, 15.9) for any mental health conditions. Anxiety disorders were among the most common with a prevalence of 6.5% (95% CI: 4.7, 9.1), followed by disruptive behaviour disorders seen in 5.7% (95% CI: 4.0, 8.1) of youth. Attentiondeficit hyperactivity and depressive disorders were estimated among 3.4% (95% CI: 2.6-4.5) and 2.6% (95% CI: 1.7,3.9) of youth, respectively.³ These findings are generally consistent with the median prevalence^a values reported in a 2009 review.⁴ Significant heterogeneity has been seen in mental health prevalence estimates across the pediatric literature,⁵ and the global coverage and availability of prevalence data are often limited.⁶ However, the globally ubiquitous nature of mental illness is well established,⁷ affecting nearly 20% of youth in the past year and 33% over their lifetime.⁴ Close to 70% of mental health problems appear during childhood or adolescence.⁸ In 2011, an estimated 23.4% of Canadian youth ages 9-19 years were living with a mental illness. ⁹ Population-based figures have remained relatively stable with similar studies conducted in 2002 and 2007.10,11

^a In this review study, median prevalence values were computed for each category of mental illness, from the various estimates provided in the literature.

1.1.2 Burdens and consequences

Mental illness in childhood and adolescence is associated with a range of sequelae experienced over the lifetime. Children suffering from internalizing and externalizing mental health issues, enter adulthood with lower educational attainment and lack the skills necessary to be competitive in the workforce.¹² In turn, they are less likely to attain employment than their mentally healthy peers, and more often work temporary jobs, receive lower wages, or rely on disability support.^{13–15} The effects of early in life mental health problems can also extend into adverse interactions with law enforcement. Following a sample of New Zealanders (n=1265) from birth, Fergusson et al. (1993) saw that children experiencing conduct or attention deficit disorders at age 6, 8 and 10 years, were more likely to commit juvenile offenses by the time they were 13 years old.¹⁶ Further into the life course, mentally ill adolescents have also been shown to have more a negative quality of life 17 years later, compared to youth who initially experienced physical illnesses.¹⁷

Social development and functioning in adulthood are also closely linked to mental health problems appearing in youth. Mollborn and Morningstar (2009), followed a cohort American high school and middle school girls (n=6,391) over six years, finding that psychological distress along with other psychosocial factors (e.g., academic achievement, family structured) was associated with later childbearing.¹⁸ Such issues can also extend into maladaptive child-rearing practices. As noted by Byford et al. (2014), adolescents with conduct-related problems were more likely to exhibit coercive parenting behaviour, compared to those without conduct issues.¹⁹ Forming and maintaining intimate social relationships may also be challenging for many mentally unwell youth. By the age of 50, these individuals were less likely to be married or cohabiting with a partner, compared to a psychologically healthy sibling.²⁰

Unsurprisingly, when mental health conditions go untreated, their later impact appears to contribute to a range of public health issues, including suicide, obesity, alcohol and substance misuse, and smoking.²¹ Emerging evidence also suggests intergenerational transmission of poor mental health, given the chronicity and known hereditary component of a large proportion of mental health conditions.²² Shedding light on the economic consequence of the poor life outcomes associated with early-onset mental health illness, an American study approximated the total lifetime cost of childhood mental health problems to be about \$2.1 trillion, on the basis that at least 5% of the American adults experience these issues early in life.²³ In Canada, a \$50 billion economic cost is estimated from mental illnesses, from direct health care utilization, and indirectly through workplace disability, lost workdays, and underperformance.²⁴ Driven by Canada's anticipated population growth, a projected 1.2 million children and adolescents are expected to live with mental health problems by 2041, corresponding to a projected \$105.6 billion (excluding dementia) in annual, direct and indirect health system costs.²⁴

1.1.3 Current state of mental health care

The stigma and social rejection of those with mental health issues continue to be perpetuated in the western world.²⁵ While large-scale anti-stigma campaigns, such as "Bell Let's Talk" (Canada), "Time to Change" (United Kingdom), "Beyond Blue" (Australia) do exist, it is unclear whether these short-term, dialogue promoting initiatives have sustained impact.^{26–28} Additionally, effecting change at a system-level requires a shift beyond just awareness and discussion, towards actions that support and empower those affected by mental health problems.²⁹ This is particularly challenging as mental health remains an undervalued component of health. Despite multiple calls for funding by health care providers, researchers, and policy experts, only 7.2% of Canadian health spending is towards mental health, with lower per capita new investment into mental health than other developed countries.³⁰

Recently, the Canadian government has confirmed \$11 billion in provincial/territorial funding over the next 10 years, to improve access to home care and mental health services, with youth recognized as a priority.³¹ Historically, similar federal transfers have inadequately held provincial and territorial governments accountable to their allocation and utilization of such funds. Additionally, data from a nationally representative sample of Canadian adults (n=1,286) indicated that 67% agreed that the federal government should ensure accountability, by developing indicators to monitor outcomes and progress on fund utilization.³² Potential mechanisms have also been proposed by Bartram and Lurie 2017, including federal oversight over distributed funding, an outcome framework with clear targets, provincial/territorial co-contribution, as well as targeting funds and expense eligibility.³³

1.1.4 Rising demands on specialized mental health services

The Canadian mental health care landscape has long been characterized as a "fragmented patchwork of programs and services, many of which face a constant struggle to find adequate resources to meet ongoing demands."³⁴ Effective evidence-based treatments exist for many mental health illnesses.³⁵ Research has also shown that such treatments can be beneficial for youth,³⁶ and preferred by youth compared to medication.³⁷ However, these services are often delivered by mental health professionals (psychologists, psychiatrists, social workers) working disjointedly in silos which, for youth and families, can feel like "every door is the wrong door".³⁸ Not only can these services be challenging to navigate but are insufficient and in severe shortage relative to their demand in the pediatric population.^{39,40} In one British Columbia study, 35% of youth between ages 16-18 years identifying with mental health concerns, perceived a need for a specific service but were still on a waitlist.⁴¹

1.1.5 Deficiencies in health care core preparedness

Saturation of specialist mental health services and system-level barriers to prompt care have expanded the role of primary and acute frontline health care providers in assessing and managing mental health issues, as a "de facto behavioral health care system."⁴² An American estimate suggests that nearly 34.8% of youth receiving outpatient mental health care, were solely seen by a primary care provider.⁴³ Unfortunately, many pediatric primary care providers are uncomfortable making mental health diagnoses and offering psychosocial care, due to inadequate psychiatric training and/or lack of confidence in their skills.^{44,45} In the ED, this can result in an over, and potentially unnecessary utilization of mental health personnel,⁴⁶ for assessments and triaging needs, further straining already limited specialized services. While most psychotropic medications are prescribed in the primary care setting, discrepancies between offered medication and clinical guidelines have been observed,⁴⁷ as well as an increasing number of antidepressant prescriptions without an accompanying diagnosis, suggesting inappropriate prescription.⁴⁸ In a 2015 retrospective health record review of 294,748 youth visits to 43 different American primary care clinics, proportions of youth receiving diagnosis and/or medication varied across practices.⁴⁹ Variability was partially attributed to whether primary care providers perceived accessibility of community-based psychiatrists. However, the need to investigate the role clinician's selfefficacy, agreement with clinical guidelines, and training have on practice variability, was identified.

The Canadian Medical and Psychiatric Associations have made joint calls for improved psychiatric education in undergraduate and postgraduate medical training, professional development opportunities, and availability of physician decision-making tools.⁵⁰ Collaborative and multidisciplinary approaches to mental health care are also promising,^{51,52} however only 18-24% of pediatric primary care providers co-manage patients with mental health issues with

specialty care.⁵³ One study showed that general pediatricians (n=305) completing 4 or more weeks of developmental, behavioural pediatric training compared to those that did less, were 1.8 times (95 % CI: 1.06, 3.08) more likely co-manage their patients.⁵⁴ Ultimately, inadequate community-based mental health care provisions for youth combined with limitations of the primary care system, have contributed to a rising dependence by youth and families on the emergency department (ED) for first contact with mental health care.^{55,56}

1.2 Youth mental health and emergency services

1.2.1 ED utilization for mental health

The prevalence of various mental health conditions has remained mostly stable; however, ED utilization for mental health services continues to rise across North America.^{57–62} Between 2006-07 and 2016-17, the Canadian Institute of Health Information found that the rate of mental health-related ED visits and hospitalizations (per 100,000 population) among young people 5-24 years in age, increased by 66% and 55% respectively. Within the same period, physical complaint-related hospitalizations decreased by nearly 22%.⁶³ These rises may reflect growing dialogue around mental illness and help-seeking in efforts of the large-scale anti-stigma campaigns discussed previously. While such campaigns encourage openness around mental illness, lacking navigational support through the health care system, limited access to low-barrier mental health services,³⁸ and unavailability of primary care providers,⁶⁴ may contribute to the rising number of inappropriate ED visits made by youth and families.⁶⁵

The ED's role in managing acute mental health emergencies is well established,^{57,59,66} however recently it has become an access point for mental health resources and guidance on self-management, as ED's are immediately accessible (open 24-hours, every day) and require no referral.⁶⁷ Traditionally, entry into the mental health care system has occurred through primary care or educational systems.⁶⁸ Cloutier et al. (2010) found that in Canadian youth and parents

(n=241) presenting to a pediatric ED for mental health-related concerns, "help/guidance for child" was the most frequently reported visit expectation (41.9%), compared to "health care/ professional resources" (29.1%).⁶⁷ These findings align with the growing burden of non-emergent ED visits, which are rising across pediatric ED's in Canada. Correlation between frequent return visits and low symptom severity may partly explain this.⁶⁹ And while the ED is more likely to serve as primary access to mental health support for these youth, their wait times can exceed time spent in treatment.⁷⁰ Despite these trends, the literature on pediatric mental health visits to the ED conflicts with information on triage composition. In a retrospective health record review (n=365) of youth 10-17 years, Newton et al. (2014) saw that mental health-related complaints to the ED were predominantly for urgent (51.5%) or emergent (41.1%) concerns.⁶⁶

1.2.2 Socio-demographics of ED youth seeking mental health care

The demographic profile and characteristics of youth frequently visiting the ED has been thoroughly explored but is variable across studies. Generally, youth visiting the ED for mental health-related concerns are more likely to be female, youth 13-17 years in age, and present with psychiatric comorbidity or suicidality.^{71,72} A systematic review by Leon et al. (2017) found low socioeconomic status, involvement with child protective services, and prior or on-going mental health service use, as common predictors of repeated ED visits.⁷³ Race and ethnicity may also be associated with repeat mental health-related ED visits.⁷⁴ First nations status has also been associated with increased ED use. In a six-year population cohort of youth (n=30, 656), Newton et al. (2012) saw higher rates ED utilization for mental health crises among First Nations youth, compared to other youth on welfare, government-sponsored subsidies, or those receiving no subsidy.⁵⁸

The connectivity of ED-visiting youth with community-based mental health care has varied in different studies. A recent multicentre Canadian study found that 63% of youth seeking

mental health care in the ED (n=373), were already connected to care.⁷⁵ A larger populationbased study of youth (age 10-24 years) seeking care for mental health complaints to an ED in Ontario (n= 118, 851) over a 4-year period, found that only 46.5% had prior connection to a physician (e.g., general practitioner, psychiatrist) regarding their mental health concerns.⁵⁶ Additionally, these youths were more likely to be of low-income background, have no regular primary care provider, have substance use-related comorbidity, reside in rural areas, or have refugee or immigrant status.

1.2.3 Clinician attitudes and training

In their grounded theory qualitative inquiry, Sukhera et al. (2017) posit that system-level disparities in resources may result in complex or chronic mental health issues being labelled by ED clinicians as unfixable, time-consuming, and unpredictable. Labels that promote avoidance behaviour, along with clinician's perceived lack of self-efficacy in treating youth, result in fear, frustration, and helplessness around managing mental health presentations.⁷⁶ Patients and caregivers have also characterized ED personnel as uncompassionate and insensitive towards their issues.⁷⁷

Negative attitudes and poor self-efficacy among ED physicians may stem from inadequate training. A cross-sectional study of pediatric ED physicians (n=576) found that nearly 44% named "lack of training" as a barrier to screening their patients with mental health issues.⁷⁸ Generally, ED nurses and non-psychiatric physicians perceived a lack in their clinical knowledge and skills in appropriately caring for patients with mental health concerns.⁷⁹ In a review of American emergency medicine training programs, only 24% of general and less than 3% of pediatric-specific programs offered some form of psychiatric training.⁸⁰ Such knowledge gaps may also help to explain ED clinicians' variable clinical judgement around psychiatric emergencies, with one study noting 33% disagreement between emergency physicians and psychiatrists on the decision to involuntarily hold a psychiatric patient.⁸¹

1.2.4 Mental health triage priority and discharge planning

Australian literature has shown that training deficiency among nurses may result in mental health-patients receiving a lower urgency/acuity status in the ED, compared to those with physical illnesses.^{82,83} Even among comorbid patients, a mental health component can result in lower triage status than those with solely a physical complaint. This was seen in a Canadian study of acute myocardial infarction patients (n=6784), where the odds of lower triage were 1.26 times higher with a charted history of depression, compared to no documentation.⁸⁴

After an ED visit, comprehensive discharge planning, including collaborative agreements between multidisciplinary inpatient and outpatient mental health teams, is crucial in supporting a patient's connection to community-based care and reducing reoccurring ED visits.⁸⁵ Unfortunately, less than half of Canadian pediatric ED's have implemented urgent postdischarge follow-up models, either through a co-located clinic or mobile teams.⁸⁶ Discharge is most the common disposition outcome for youth presenting with mental health issues; however, 32-48% of youth will not receive discharge instructions.^{87,88} Many young people do not receive urgent outpatient services within a month of their index ED visit; ⁸⁹ this is especially troubling for suicidal youth, whose risk of suicide mortality post-discharge is 5.8 times that of youth with non-suicidal behaviour.⁹⁰

1.2.5 ED environment and flow

Structurally, the ED is often a chaotic and fast-paced environment that sees rapid patient turnover which may contribute to patient perceptions that staff are uncaring.⁹¹ Dolan et al. (2011) found that these characteristics in addition to the ED's lack of privacy, make it counterproductive to de-escalating agitated youth.⁹² Compared to youth with other complaints, mental health-

related visits have also been associated with longer lengths of stay.⁹³ Not only does this contribute to overcrowding and straining of ED personnel and resources, but it allows mental health conditions to exacerbate further and adversely impact youth's mental health outcomes. ⁹³ The stagnant ED flow of patients with mental health issues speaks to the availability of EDbased mental health care. Leon et al. (2013) found that only 30% of Canadian pediatric EDs (n=15) had ED-based mental health care teams, 73% reported available in-house social services and mental health nurses, and 87% had psychiatry consults.⁸⁶

1.3 Youth mental health and acute psychosocial evaluation

Deficient and saturated mental health and primary care systems have seen rises in mental health-related visits to pediatric and general EDs across North America. ED clinicians will often have insufficient mental health training and employ variable and evidence-lacking approaches to assess for and support patients with mental health issues.^{94,95} As a result, standardized assessment tools have been recommended to support them in deciding on appropriate care pathways for youth.⁹⁶

1.3.1 Existing psychosocial instruments

The 'HEADSS' along with its common variants (e.g., HEADS, HEADDS, HEEADSSS) and 'HEADS-ED'^b are tools currently used in acute care settings to document and broadly assess psychosocial stressors contributing to physical and mental illnesses in youth.^{97–99} HEADSS is a youth psychosocial interview tool facilitating patient-clinician communication to obtain a developmentally-appropriate history, using structured guiding questions that foster a sympathetic and confidential environment.^{98,99} HEADSS interviews youth on major areas of psychosocial

^b The acronym HEADS stands for Home, Education, Activities/peers, Drugs, Suicidality. HEADS-ED stands for Home, Education/employment, Activities/peers, Drugs/alcohol, Suicidality, Emotions/behaviours/thought disturbance.

stress, intentionally beginning with less emotionally charged topics, such as their home situation, educational issues, whether they are engaged in activities, to help youth feel comfortable and safe disclosing to a clinician. The interview ends with more charged issues such as substance or alcohol misuse, sexual behaviours, as well as depression and suicide potential.⁹⁸

HEADS-ED is a 7-item clinician-administered survey, using a 3-point Likert scale to evaluate the need for action (none, non-immediate, immediate) for different psychosocial stressors. HEADS-ED expands on HEADSS by including additional items on 'Emotions, behaviours, thought disturbances' and 'Discharge resources.' As is the case with the former item, the tool does not distinguish psychiatric concerns from those that are social and behavioural, which can have different service provisions associated with them. Unlike HEADSS and its variants, HEADS-ED may also recommend urgent psychiatric intervention if a youth's composite score is seven or higher, or if their 'Suicidality' item exceeds a set cut-off. However, this recommendation may not adequately support clinicians working in ED's without mental health readiness, where they are solely responsible for concern management and discharge planning. Moreover, a *Psychiatric Times* article stated that HEADS-ED would include recommendations for outpatient care in the future,¹⁰⁰ however its current form does not recommend different levels of mental health care.

1.3.2 HEARTSMAP

An expanded ED-specific digital psychosocial assessment and management tool called HEARTSMAP was developed by emergency and psychiatry teams at the BC Children's Hospital, to address challenges with existing tools and offer more extensive psychosocial coverage. HEARTSMAP enables standardized mental health assessment across 10 psychosocial areas for all youth presenting to the ED with mental health issues. The tool also supports clinicians with patient management in the ED and service referrals, with a complex decision-

making algorithm that triggers acuity-specific mental health resources recommendations.¹⁰¹ HEARTSMAP assessments conducted by experienced clinicians may take between 15-20 minutes to complete; however, this can vary depending on the patient's psychosocial complexity and responsiveness during the interview. A paper version of HEARTSMAP can be found in Appendix A.

HEARTSMAP facilitates clinician's efforts to collect pertinent psychosocial information relating to ten evidence-based psychosocial factors associated with youth's mental well-being. HEARTSMAP The ten tool sections include: Home,^{102–105} Education and activities,^{106,107} Alcohol and drugs,^{104,106,108–110} Relationships and bullying,^{103,111,112} Thoughts and anxiety,^{105,106,113} Safety,^{114–116} Sexual health,^{104,108,117,118} Mood and behavior,^{104–106,119} Abuse,^{102,104,109} and Professional resources.^{110,120–122} For each of HEARTSMAP's ten section, clinicians use specific guide questions and scoring rubrics to assess the severity of the patient's condition, on a 4-point Likert-type scale (0 to 3,) scoring a 0 (no concern), 1 (mild), 2 (moderate) or 3 (severe). In each section, an additional binary scale allows clinicians to assess the urgency of care needed, by recording whether patients have or have not already accessed resources for that area of concern.

Each HEARTSMAP section links to at least one higher-level domains that reflect broader dimensions of their psychosocial well-being including social issues/environment, behaviour, developmental health, and psychiatric health, as shown in Table 1.3.1. These domains are associated with different mental health service provisions, with several degrees of acuity of access based on domain scores (composite of sectional severity scores) and the resources youth already have in-place (for each section). HEARTSMAP's decision-making algorithm (see

Appendix B) triggers recommendations based on sectional severity and resource scoring patterns and domain scores.

Sectional scores:	Social issues	Functional abilities	Youth health	Psychiatry
Home	0-3			
Education & activities		0-3		
Alcohol & drugs	0-3	0-3	0-3	
Relationships & bullying		0-3	0-3	
Thoughts & anxiety				0-3
Safety				0-3
Sexual health	0-3		0-3	
Mood & behavior				0-3
Abuse				
Professionals &				
resources				
Domain scores:	0-9	0-9	0-9	0-9

 Table 1.3.1. Score composition for each of HEARTSMAP's four domains.

Tool-triggered recommendations for different health service areas include psychiatric assessment, adolescent medicine or substance misuse/addiction services, and social work services to provide family support and educational support/counseling. Recommendations are also acuity-specific, ranging from emergent (in-hospital psychiatry consultation), urgent (community crisis response team with assessment within 72-96 hours), to less acute (outpatient specialty mental health services, community-based mental health clinics). Incorporating tool recommendations into a patient's care plan is at the discretion of clinicians, as the tool supports clinical judgement, but its recommendations are not binding.

Relative to the measures discussed above, HEARTSMAP offers wider psychosocial coverage, including sections on 'Sexual health' and 'Abuse' (past and present abuse) to gauge whether youth may benefit from connectivity with social work services or an adolescent health specialist. Aside from suicidality, the tool also allows assessment of youth's homicidality risk.

Additionally, HEARTSMAP distinguishes psychiatric issues such as potential thought disorders and abnormal behaviours that may be associated with mood disorders or other mental health issues. This was done by separating the 'Emotions, behaviours, thought disturbances' HEADS-ED item into two distinct items, 'Thoughts & anxiety' and 'Mood & behaviour', for each of these distinct psychiatric symptoms. The 'Discharge resources' HEADS-ED item assesses overall whether youth have, are waiting for, or do not already have mental health supports inplace. HEARTSMAP accomplishes this through its 'Professionals & resources' section, and evaluates resource use for each specific psychosocial area, recognizing that distinct services and supports may already be in place for the tool's different sections.

1.3.3 Developing and evaluating HEARTSMAP

HEARTSMAP was developed through a collaborative partnership of the Departments of Psychiatry and Emergency Medicine at BC Children's Hospital. Tool developers, Drs. Quynh Doan and Tyler Black, first reviewed HEADSS and HEADS-ED and incorporated additional evidence-based psychosocial factors that were clinically meaningful in understanding youth's psychosocial functioning. Sections were then grouped into a priori four-domain structure, with each domain reflecting a broader component of psychosocial wellness with specific service provisions. Child and Adolescent Psychiatrists conducted an expert review of HEARTSMAP's sections and domains, providing evidence towards its clinical acceptability and content validity. In a consensus-driven process, these clinicians used HEARTSMAP to retrospectively score a range of mental health cases to decided appropriate sectional (severity and resource) and domain scoring cut-offs for each tool-triggered recommendation. Similarly, pediatric emergency clinicians evaluate the tool's face validity and acceptability during HEARTSMAP's pilot implementation in the ED. HEARTSMAP's psychometric properties were evaluated in two stages. First, a retrospective cohort study was conducted, where clinicians applied HEARTSMAP to score a random sample (n=104) of mental health-related visit charts to the ED with sufficient psychosocial documentation, of medically stable youth under 17 years in age. This investigation evaluated the tool's interrater reliability among the pediatric emergency clinician population and HEARTSMAP's predictive validity, assessed in terms of the tool's inherent sensitivity and specificity for predicting urgent psychiatric support. Pediatric emergency physicians displayed substantial agreement (κ =0.70) in triggering the 'urgent psychiatry consultation' tool recommendation. Fair physician agreement (κ =0.40) was seen for both outpatient crisis response and non-urgent community-based mental health clinic recommendations. HEARTSMAP demonstrated a sensitivity and specificity of 76.2% (95% CI: 62.8, 89.5%) and 64.8% (95% CI: 54.6, 75.1%) respectively, in predicting psychiatric admissions or ED return visits on retrospective cases.

A prospective cohort study was then conducted during the tool's pilot implementation in pediatric ED, with a cohort of 70 youth presenting to the ED with mental health-complaints, 62 of whom were evaluated using HEARTSMAP. A total of 17 study youth were admitted at either their index or had a return visit (within 30 days), all of whom received HEARTSMAP assessments (during index ED visit) with a tool recommendation for urgent psychiatric consultation. These findings indicate that HEARTSMAP demonstrates high sensitivity (100%), with moderate specificity (36%), and is valid in predicting needs for urgent psychiatric assessment. All study participants receiving tool recommendations for community-based care had accessed these resources by the two-week follow-up.

1.3.4 HEARTSMAP theoretical framework

Approaches taken to HEARTSMAP's development are consistent with clinimetric and communimetric theories of health measurement. HEARTSMAP encompasses clinimetric principles outlined by Feinstein (1987), wherein comparison to classical psychometric theory, HEARTSMAP's development and item selection were based on clinical judgement and the need for face validity rather than statistical criteria of inter-item correlation.^{123–125} Additionally, scoring was meant to be simple for ease of interpretation, and there were no restrictions on the use of complex double-barrel items. Communimetrics emphasizes the tools overall communication value and understanding which observations (e.g., aspects of psychosocial wellbeing) of an individual are the most important for the tool to capture and communicate.¹²⁴

Clinimetric and communimetric approaches share some commonality with respect to their input processes of what phenomena the tool will measure, under what conditions, and from what source(s). However, HEARTSMAP's output processes of how measurement results are communicated and used, are more consistent with communimetric theory, where tool collected information translates into effective intervention or service planning for individuals. HEARTSMAP draws on core principles of communimetrics as each included item (and assigned score) has immediate resource implications (i.e., acuity-specific recommendations). Moreover, each of HEARTSMAP's psychosocial areas are scored keeping the service context (i.e., whether mental health resource are already in-place) in mind. The measurement process is also descriptive, characterizing the youth's psychosocial status rather than making cause-effect assumptions, with integrated reporting from youth and their legal guardians based on recent/acute psychosocial stressors experienced.

1.4 Youth mental health and screening interventions

Preventive measures such as mental health screening have immense potential in allowing early detection and more effective intervention, thereby lessening the burden of mental health conditions, and preventing or delaying their progression.^{126,127} Given the previously discussed deficiencies of the primary and acute health care systems, childhood and adolescent mental illness often goes undetected and untreated, collectively by health care professionals, families, and youth themselves.^{128–130} The invisible nature of these concerns contributes to their chronicity, heightened severity, and reduced likelihood of successful intervention in adulthood.¹³¹

Poor help-seeking behaviours among the youth population can contribute to mental health concerns going undetected. Studies suggest that across age groups, children and adolescents are the least likely to seek help for mental health issues, including their parents/guardians.¹³² In the 2012 Canadian Community Health Survey, only 41.6% (95% CI: 35.0, 48.5) and 35.8% (95% CI: 30.7, 41.2) of youth (ages 15-24 years) reporting experiences of depression or suicidal thoughts in their lifetime, respectively, sought professional support. Nearly 61.4% (95% CI: 54.6, 67.8) and 57.9 (95% CI: 52.2, 63.3) of respective youth consulted informal sources such as friends, family, teachers, and the Internet.¹³³ Of youth ages 12 and older suffering from emotional symptom in a 12-month period, only 8.3% sought help.¹³⁴ While national data on Canadian youth under 15 is generally limited with respect to mental health helpseeking, an Australian national mental health survey found that only 25% of youth ages 4-17 years with a diagnosable mental health condition used services six months before the study.¹³⁵ Particularly less likely to seek help are those experiencing suicidal thoughts or depressive symptoms,¹³⁶ holding negative attitudes toward seeking help, have had negative past experiences with care providers, or believing they can deal with issues on their own.¹³⁷ The latter determinant becomes evident in the childhood to adolescence transition, as young people begin to seek greater autonomy in managing challenges on their own and may have issues trusting or confiding in others, which may not be taken into account in interventional strategies.¹³⁸

The stigma surrounding mental illness has also been well established. Public stigma or the negative societal-level attitudes are made up of a cycle of negative stereotype, prejudice, and discrimination.¹³⁹ A cycle that encourages mentally ill individuals to remain silent in fear of rejection can lead to internalized stigma, resulting in shame, fear, and embarrassment towards oneself. The fear of stigmatization is exceptionally high among young people and may come from family members, peers, and teachers.¹⁴⁰ These sources of stigma are unintuitive, as family is one of the most common channels of help-seeking accessed in early-adolescence.¹³² As a result of poor help-seeking and stigmatization of mental health issues, mental health concerns may remain untreated, growing in severity and their overall impact on youths' mental wellness and ability to go about their daily lives.¹⁴¹

1.4.1 Mental health screening in the ED

Insufficiency of the existing ED mental health infrastructure to support rising use has prompted the American Academy of Pediatrics to prioritize early detection of mental illness and recommend standardized, evidence-based psychosocial screening tools for the ED,⁵⁵ where many youths will present with non-urgent health issues.^{142,143} Tools demonstrating ED-specific psychometric properties, such as the Risk of Suicide Questionnaire (RSQ), Ask Suicide Questions (ASQ), Alcohol Use Identification Test (AUDIT), one- and two-item depression screens, and the screen for Child Anxiety Related Emotional Disorders (SACRED), targetspecific areas of concern (e.g., depression, suicidality, anxiety).^{95,144–148} Nonetheless, specialized tools have shown great promise in identifying of psychiatric problems. Validation studies of such instruments have found variable percentages of pediatric ED youth test positive for some mental health-related issue , including moderate/severe depression (20%),^{149,150} symptoms of anxiety disorder (33%)¹⁴⁵, clinically significant suicidal ideation (5%),¹⁴⁴ or overall psychosocial impairment (45%).¹⁵¹ Tools able to predict in-patient admission have also been associated with reductions in length of stay, unnecessary restraint orders, and reliance on security personnel.⁹⁵

Strikingly, few psychometrically evaluated^c mental health instruments provide widespread coverage of psychosocial issues that can be implemented in time-efficient screening programs in ED settings. Given that significant practice pattern variation is seen in emergency care,¹⁵² digital tools may standardize the quality of care received by youth with mental health complaints and support clinical decision-making. For physical conditions (e.g., pneumonia, acute pulmonary embolism, and respiratory infection) such tools have previously improved resource allocation, reduce overutilization, and evidence-informed clinical practice in ED treatment.^{153,154}

General mental health screening instruments also create the opportunity to routinely collect patient-reported outcomes, information that may be used to track health status and assess the quality of care longitudinally.¹⁵⁵ However, emergency physicians may not appreciate these benefits of standardized tools, given the acute and episodic nature of their practice and the ethical implications and expectations of following up on collected data.¹⁵⁶

1.4.2 Barriers to mental health screening

While screening may improve recognition of mental health issues, standardized tools are seldom used by primary care providers and ED clinicians in their practice. Brown et al. (2010) found that the Strengths and Difficulties Questionnaire captured twice as many youths with moderate mental health symptoms and 28% more with severe symptoms, compared to pediatric primary care providers.¹⁵⁷ However, routine use of evidence-based instruments is challenged by

^c The use of the term psychometric evaluation in this thesis corresponds to an instrument's reliability and validity in a specific study population.

a lack of time, as well as low reimbursement for screening¹⁵⁸ and subsequent patient counseling. There is also concern that without sufficient training or collaborative decision-making to interpret and follow-up on screening results, clinicians may cautiously refer all positive screens to unnecessary specialist mental health care.^{159,160} Yet, families and youth are responsive to such tools and felt positively about screening interventions that were framed as confidential, sensitive, universal, and intended to bring attention to and address their concern.^{161–163} Acute and primary care providers have also found these tools acceptable.^{162,164}

2.0 Research rationale and thesis objectives

2.1 Clinician-administered psychosocial evaluation

Responding to growing reliance on the ED for mental health-related care as well as challenges with existing psychosocial evaluation measures, HEARTSMAP was developed to support emergency clinicians in offering standardized and evidence-based assessment and management for youth presenting with mental health-complaints in ED. A retrospective and prospective cohort study found that HEARTSMAP is a valid instrument in predicting psychiatric hospitalization and that a pediatric emergency clinician population can reliably score concern severity and urgency using the tool.

However, an American study found that a substantial proportion of youth lacked timely access to acute care settings with pediatric readiness.¹⁶⁵ Similarly, a Canadian cross-sectional study found that most Ontario EDs lacked adequate facilitates for pediatric patients.¹⁶⁶ As such, most youth will make mental health-related visits to general community-based EDs, where they could be cared for by a range of clinicians with differing skill sets. Therefore, it is necessary to evaluate whether a broader population of ED clinicians can reliably score the severity and acuity of psychosocial issues using HEARTSMAP, should the tool be implemented in diverse acute

care settings. Such an evaluation would also contribute evidence towards the tool's ongoing evaluation.

Thesis objective one: to evaluate the interrater reliability of HEARTSMAP, among a diverse sample of physicians and allied health workers

2.2 Self-administered psychosocial evaluation

Beyond targeted assessment in the pediatric mental health patient population, the ED environment is chaotic⁹¹ and time constraints can limit a clinician's ability to carry out universal screening for all patients.^{167,168} Self-reporting screening tools reduce the burden on ED personnel and resources and have a minimal impact on patient flow.¹⁶⁹ Digital self-screening can enhance disclosure among youth, allowing them greater privacy and confidentiality in reporting issues, and better articulate their concerns, compared to face-to-face interactions with health care providers.^{170,171} Youth typically seen in the ED are more likely to be exposed to risk factors for mental illness such as homelessness¹⁷² and abuse.¹⁷³ Keeping this sociodemographic profile in mind, universal self-screening in the ED casts a broader net to identify concerns, including school dropouts who would not be identified through the education system and youth inaccessible through other health care settings.¹⁷⁴ With nearly 40% of Canadian ED visits triaged as low-acuity, the ED's is increasingly being used as an equivalent to primary care, allowing for screening of not only at-risk and vulnerable youth, but youth with mild to severe health concerns.^{175,176}

Extending the clinical HEARTSMAP tool into a version (called MyHEARTSMAP) youth and families can directly self-screen with may be more suitable for ED-based universal screening. Further discussion on the adaption of the clinical tool into this lay version is covered in chapter 3.0. Studies with well-established measures such as the Strengths and Difficulties

Questionnaire have shown that supplementing youths' self-report with proxy-reporting by a parent informant improves classification of emotional concerns in community and clinical samples of youth.¹⁷⁷ Such studies have suggested an informant gradient, where screening properties (sensitivity, specificity) improve, going from self-reporting by youth, to proxy-reporting by a parent, to having both informants.¹⁷⁸ Reporting discrepancies are common between youth and parents and can lead to inconsistent information on youth's psychosocial status,¹⁷⁹ and unnecessary or inappropriate mental health service recommendations. For this reason, and the fact that youths' health status may limit their ability to screen in the ED and screening may rely solely on parental reporting, measuring how reliably youth and parents can score using MyHEARTSMAP is necessary to ensure consistent and reproducible assessment data.

<u>Thesis objective two:</u> to adapt the clinical psychosocial assessment and management tool into a lay version—MyHEARTSMAP— that youth and parents can reliably self-administer.

Chapter 2: Study 1—Reliability of HEARTSMAP

Title: Reliability testing of the HEARTSMAP psychosocial assessment tool for multidisciplinary use and in diverse emergency settings

2.1 Abstract

Objective: HEARTSMAP is a tool developed to facilitate the assessment and management of paediatric patients with mental health issues by emergency department (ED) clinicians. To evaluate the interrater reliability of HEARTSMAP when administered by ED clinicians that often interact and care for youth with mental health concerns.

Methods: In a cross-sectional study initiated in 2016, collaborating clinician evaluators (n=16) applied the digital HEARTSMAP tool to a set of 50 fictional clinical vignettes, in a manner consistent with the tools anticipated access and usage in clinical settings. Evaluators came from remote/rural, regional, and urban academic health centres from across British Columbia, Canada. **Results:** Overall moderate to near perfect agreement is reported among clinicians, for all ten of the tool's psychosocial sections (κ =0.43 to 0.93) and domain (κ =0.75 to 0.90), with slight to substantial agreement across all tool-triggered service recommendations (κ =0.36 to 0.65). **Conclusions:** Study findings indicate that HEARTSMAP will provide reliable scores when used by ED clinicians to assess mental health issues among youth. Study results will add to HEARTSMAP's ongoing validation and inform its clinical implementation as a standard assessment tool, in diverse emergency care settings.

2.2 Introduction

Close to one million Canadian youth are living with mental health (mental health) concerns. In Canada's fragmented mental health care system,^{29,180} emergency departments (EDs) have become 'safety nets' for families experiencing mental health concerns, and struggling with the unavailability of primary care.^{180–183} Unsurprisingly, mental health-related visits made by youth and adolescents are rising across North American EDs, increasing annually by 3-7% in Canada,^{57,63,184} and making up 7.2% of ED visits in the USA.¹⁸⁵ However, ED clinicians are often insufficiently trained in assessing levels of mental health risk and managing these concerns.¹⁸⁶ Standardized clinical tools have been recommended by the American Academy of Pediatrics Committee on Pediatric Emergency Medicine;⁹² however, most existing tools target specific concerns (e.g., depression, suicidality, anxiety),^{144–146,187} are generally time- and energyconsuming for clinicians,¹⁸⁷ or have not been validated for ED use.¹⁶³ HEADS-ED is a brief, EDspecific mental health screening tool developed by Cappelli et al. (2012), allowing clinicians to rate psychosocial issues' severity and determine whether youth require immediate intervention.¹⁸¹ However, in its current form, the tool does not clarify the urgency or types of services needed and does not distinguish psychiatric from social or behavioral concerns.¹⁰⁰

A rapid youth psychosocial assessment and management tool, called HEARTSMAP (http://heartsmap.ca),¹⁸⁸ was developed at the British Columbia Children's Hospital to address challenges with existing tools and to respond to the growing reliance on ED clinicians to assess for psychosocial health and risk areas. Comprehensive psychosocial assessments using HEARTSMAP generate severity and urgency-specific service recommendations, to aid clinician decision-making during their patient interview. Unique to the tool is its ability to distinguish severity and acuity for psychiatric, social, and behavioral issues.
Prior evaluation of the tool's psychometric properties has deemed the tool valid in predicting youth who require urgent assessment by a mental health specialist and hospitalization. However, the tools inter-rater reliability, a sample-dependent property, has only been evaluated among pediatric emergency clinicians, who have displayed moderate to substantial interrater agreement in triggering HEARTSMAP's out- and inpatient psychiatric service recommendations. Previous tool investigations have not included clinicians from general EDs, where most youth visits occur and are known to differ from pediatric EDs in terms of treatment patterns, case mix, and wait times.¹⁸⁹ Their inclusion is especially important given the higher likelihood of repeat visits, among youth seeking mental health care in general EDs.⁶⁹ In pediatric and general EDs, handovers, or transfers of care from one clinician to another, are a significant contributor to inefficiency and errors in acute care.¹⁹⁰ There is a clear need for psychosocial clinician decision-making tools that are reliably applied by the various ED clinicians that may be involved in the course and treatment of mental health patient.

This study aimed to contribute to the ongoing development of HEARTSMAP by evaluating the reliability of the tool when assessing youth mental health complaints in a diverse range of EDs. Interrater agreement was measured on HEARTSMAP scoring patterns and tool triggered-recommendations, among ED clinicians from distinct types of medical care centres, ranging from small community-based, rural/remote, large regional and urban academic centres. Completion of this aspect of the psychometric evaluation will ensure that the HEARTSMAP tool can be reliably used outside a paediatric quaternary care referral ED, by a diverse range of clinicians. High inter-professional reliability will ensure consistency in acute mental health assessments in the ED, where physicians and various allied health workers are constantly in close interaction and collaboration to deliver integrated patient care.

2.3 Methods

2.3.1 Study design and objectives

A cross-sectional study was conducted between May and November 2016, where participants (n=16) used HEARTSMAP to perform a psychosocial assessment and trigger management recommendations for a set of 50 fictional clinical vignettes. The objective was to measure the interrater agreement of a range of clinicians in using HEARTSMAP. Particularly, among clinicians who typically conduct emergency psychosocial assessments for youth (e.g., emergency physicians, psychiatric liaison nurses, social worker and emergency nurses and nurse practitioners). This study was reviewed and approved by the University of British Columbia Children's and Women's Hospital ethics review board (H15-02249).

2.3.2 Study population and setting

A convenience sample was obtained that included paediatric and community ED clinicians from four health authorities in British Columbia, including the Provincial Health Services Authority, Vancouver Coastal Health/Providence Health, the Fraser Health Authority, and the Interior Health Authority. Clinicians took part as collaborating evaluators and were approached through email invitations and call outs to medical directors and other leadership in emergency and mental health services in participating health authorities. Evaluators took part remotely, given their varying geographic locations.

2.3.3 Power analysis

An a priori power calculation was conducted using a nomogram developed by Hong et al. (2015).¹⁹¹ Approximately 800 vignette ratings were needed to detect a 5% difference in percent scoring agreement, or agreement under the alternative hypothesis of 60%, when scoring agreement under the null hypothesis is 55%, with 80% power and a significance level of 5%. With each rater evaluating 50 vignettes, a total of 16 clinicians were needed.

2.3.4 Vignette development

Clinical vignettes have been previously used to evaluate variability in clinical practice and decision-making,^{192,193} and have been applied to measuring the interrater reliability of clinician assessments of mental health status.^{194,195} A pediatric emergency specialist and child and adolescent psychiatrist jointly developed the fictional clinical vignettes. Vignettes were derived from a chart review of pediatric psychosocial-related clinical presentations to the ED, as well the clinicians' empirical knowledge. Vignettes included the fictional youth demographic details (age, sex), chief complaint, and previous medical history (relevant to the ED visit). Clinical information was broken down by each HEARTSMAP section. A sample vignette is provided in Appendix C. Fifty-two percent of fictional youth were female and ranged from age 7-17 years with an average of 13.6 years.

Vignettes were based on distinct types and severity of psychosocial issues, 34% covered "depression/suicidal/deliberate self-harm", 18% were on "anxiety/situational crisis", 16% on "pediatric disruptive behaviour", 8% on each of "bizarre behaviour", "concern for patient's welfare", and substance misuse; and 4% on each of "hallucinations/delusions" and "violent/homicidal behaviour." Case mix generally reflects the most common mental health-related complaints made by youth who present to the emergency department. ⁶⁶ Finalized clinical vignettes were stored on Research Electronic Data Capture (REDCap), a standardized online data collection instrument .¹⁹⁶ REDCap was also used to host the HEARTSMAP tool, which could be enabled as an online survey for evaluators to complete remotely.

2.3.5 Analytic approach

2.3.5.1 Background on interrater reliability

Reliability is the ability to reproduce consistent assessment data and scoring over time.^{197,198} Theoretically, reliability can be understood as a ratio of true and total score variance,

and its various coefficients are used to estimate the degree of measurement error.¹⁹⁷ Validity is the tool's ability to measure what it intends to measure.¹⁹⁸ Considerable inconsistency in tool scoring can call into question the utility of assessment data, as it can be difficult to interpret information in a meaningful manner.¹⁹⁷ For this reason, reliability is necessary for validity, however, it not sufficient as high reliability does not necessarily translate to high validity.¹⁹⁹ Both reliability and validity are sample-dependent, and can be thought of as properties of the scoring result from the application of the measurement tool in a specific population.¹⁹⁹ To ensure diverse ED clinicians can reliably use HEARTSMAP, additional reliability testing is required in a sample of ED clinicians with different skill sets, working in different ED types (e.g., rural, community-based, academic centers). For assessment tools like HEARTSMAP, which rely on human raters to collect information, a fundamental threat to reproducibility is poor consistency between different raters therefore interrater reliability is a crucial type of reliability to estimate.¹⁹⁷

Interrater reliability can be defined as the extent to which an instrument ensures reproducible measurement of its distinct items, by more than one rater.²⁰⁰ This analysis aims to determine the degree of true variance in rater scoring, after taking measurement errors between raters into consideration.²⁰⁰ Analyzing agreement between raters offers a method of gauging reliability. Cohen's kappa statistic is a classic summary statistic of interrater reliability between a rater pair, which takes into consideration agreement that may have arisen due to chance. However, this measure is limited to evaluating agreement between only two-raters.²⁰⁰ Light (1971) proposed pairwise kappa computation for all rater pairs, the mean value of which offers a generalized kappa coefficient and an overall index of agreement.²⁰¹ However, for instruments measuring categorical variables with an ordinal response scoring format, the clinical significance

of scoring disagreement can vary depending on its magnitude.²⁰² Unfortunately, generalized and straightforward kappas do not account for the degree of rater disagreement. Attaching weights to kappa values can mitigate this and penalize disagreement in relation to its magnitude. Quadratic weights offer practical interpretation and interchangeability with intraclass correlation coefficients measuring the consistency of agreement for a specific set of raters, with fixed rater effects.²⁰⁰

2.3.5.2 Kappa analysis

In this study, to extend the measurement of reliability to multiple raters (n=16), Light's (1971) proposed approach to a generalized kappa statistic was used, with the application of quadratic weights, as described by Yilmaz 2018.²⁰³ An average was taken of percent agreement over all three cases to measure clinician agreement during the training phase. A small sample size did not allow for meaningful kappa analysis at this stage. For the 50 study vignettes, a mean, generalized kappa was computed for overall agreement on HEARTSMAP's sectional and domain scoring. Tool-triggered recommendations were scored on a binary scale (triggered or not); therefore, Cohen's kappa statistic was computed for each recommendation. Guidelines put forth by Landis and Koch 1971 were used to interpret the agreement, '0-0.20 'slight agreement,' 0.21-0.40 'fair agreement,' 0.41-0.60 'moderate agreement,' 0.61-0.80 'substantial agreement,' and 0.81-1.00 'almost perfect agreement.'

Subgroup analyses were performed using the Welch's t-test, as it considered potentially unequal variances and sample sizes between clinician groups. Interrater agreement was compared between physicians and allied health workers (nurses, social workers). Kappa values were analyzed for vignette quintiles, to identify potential agreement patterns over the 50 cases.

Potential trends could indicate practice effects arising from clinicians' extended exposure to the tool.

2.3.5.3 Internal consistency

Internal consistency is a type of reliability evaluating how well each scale item measures or correlates to its underlying latent variable or construct and is typically evaluated using Cronbach's alpha.²⁰⁵ The overall aim of an internally consistent instrument is to minimize overly redundant items, and have scores on similar items be related. HEARTSMAP bears similarity to instruments developed out of a communimetric framework, where item selection is guided by what information needs to be communicated on the individual's health status to support decision-making. Items may be clinically informed and not necessarily related.¹²⁴ Classical Test Theory approaches to evaluating internal consistency using correlation matrices may not be suitable given the approach used to develop scale items. Therefore, clinician scoring agreement for each of the tools five domains (composite of section mapping to the domain), was used as a proxy measure of the tool's internal consistency, as each domain score is the aggregate of three tool sections.

All study analyses were conducted using STATA 14.0 (Stata Corporation, College Station, Texas) and the Microsoft Excel 2010 Data Analysis Toolpak (Microsoft, Redmond, Washington).

2.3.6 Study procedure

Participating evaluators were trained to comprehensively understand and effectively use the tool in the clinical setting. These training sessions aimed to ensure that HEARTSMAP scoring and associated management recommendations were approached in a manner consistent with HEARTSMAP' access and use when implemented in the clinical setting. Training consisted

of a 25-minute instructional video, followed by an independent assessment of three training vignettes using HEARTSMAP. In a 20-minute telephone follow-up, evaluators reviewed their cases with the primary investigators, to identify discrepancies in scoring and interpretation and discuss areas requiring further explanation. Evaluators did not receive any additional training. Each evaluator received a link via email to access the clinical vignettes and the MyHEARTSMAP tool. Scores and triggered recommendations from completed vignette assessments were automatically recorded into the study's REDCap database for analyses.

2.4 Results

A total of 16 paediatric and general ED clinicians were recruited to evaluate a set of 50 clinical vignettes using HEARTSMAP. Nearly an equal number of clinicians was recruited from each of British Columbia's four provincial health authorities. Additional details on these evaluators are summarized in Table 2.4.1.

Table 2.4.1. Distribution of collaborating clinician evaluators by discipline and hospital types.

	Physicians (N=7)			Allied Health (N=9)		
Centres	EMs*	PEMs**	Psychiatrists	Nurses	Social Workers	
Pediatric referral centre	0	2	1	3	0	
Urban community hospital	3	0	0	2	2	
Remote regional hospital	1	0	0	1	1	
N (%) total=16	4	2	1	6	3	

* Emergency Physicians

** Pediatric Emergency Physicians

Average absolute agreement for all clinicians ranged from 61.9% (Education and activities) to 100% (Alcohol and drugs) on the three independently completed training cases. Across HEARTSMAP's ten sections, weighted kappas ranged from 0.43 (Professional and services) to 0.93 (Alcohol and drugs), when clinicians scored the 50 vignettes. The mean weighted kappa coefficients for all sections and subgroups are reported in Table 2.4.2. At the domain-level (Table 2.4.3), there was substantial to almost perfect interrater scoring agreement, with weighted kappas of 0.89 (95% CI: 0.89, 0.90) for social, 0.78 (95% CI: 0.77, 0.79) for functional domain, 0.84 (95% CI: 0.83,0.85) for youth health, and 0.75 (95% CI: 0.73, 0.76) for the psychiatry domain. Subgroup analysis looking at the overall interrater agreement on sets of 10 vignettes did not show significant agreement differences over the progression of the 50 cases.

 Table 2.4.2. Quadratically weighted kappa statistics (95% confidence intervals) for

 sectional score agreement among evaluating clinicians.

Section	All Clinicians	Physicians Only	Allied Health Only	P-values* (two-tail)
Home	0.78 (0.77-0.80)	0.78 (0.76-0.80)	0.78 (0.75-0.81)	<i>p>0.1</i>
Education & activities	0.70 (0.69-0.70)	0.70 (0.66-0.74)	0.69 (0.66-0.74)	<i>p>0.1</i>
Alcohol & drugs	0.93 (0.93-0.94)	0.96 (0.95-0.97)	0.91 (0.90-0.93)	<i>p<0.001</i>
Relationships &	0.68 (0.66-0.70)	0.64 (0.58-0.70)	0.71 (0.68-0.74)	p=0.05
bullying				
Thoughts & anxiety	0.91 (0.90-0.91)	0.89 (0.87-0.91)	0.92 (0.90-0.93)	<i>p</i> =0.025
Safety	0.82 (0.81-0.83)	0.80 (0.77-0.84)	0.82 (0.80-0.84)	<i>p>0.1</i>
Sexual health	0.90 (0.89-0.91)	0.85 (0.82-0.89)	0.94 (0.93-0.96)	<i>p<0.001</i>
Mood & behavior	0.69 (0.68-0.71)	0.68 (0.64-0.71)	0.74 (0.71-0.76)	<i>p</i> =0.009
Abuse	0.88 (0.87-0.90)	0.93 (0.90-0.95)	0.84 (0.81-0.88)	p<0.001
Professionals & services	0.43 (0.40-0.46)	0.38 (0.28-0.47)	0.46 (0.41-0.51)	<i>p>0.1</i>

*Comparing agreement among physicians versus agreement among allied health professionals

Table 2.4.3. Quadratically weighted kappa statistics (95% confidence intervals) for domainscore agreement among evaluating clinicians.

Domain	All Clinicians	Physicians	Allied Health	P-values* (two-
		Only	Only	tail)
Social	0.90	0.92	0.88	p<0.001
	(0.89-0.90)	(0.91-0.93)	(0.87-89)	
Functional	0.78	0.79	0.78	<i>p>0.1</i>
	(0.77-0.79)	(0.75-0.82)	(0.76-0.79)	
Youth	0.84	0.83	0.85	<i>p>0.1</i>
Health	(0.83-0.85)	(0.80-0.86)	(0.84-0.86)	
Psychiatry	0.75	0.72	0.78	p=0.026
	(0.73-0.76)	(0.68-0.76)	(0.75-0.81)	

*Comparing agreement among physicians versus agreement among allied health professionals.

Table 2.4.4 Simple kappa statistics for interrater agreement across ED clinician types on

tool triggered-recommendations with 95% confidence intervals.

Recommendations	All	Physicians	Allied Health	P-values*
	Clinicians	Only	Only	(two-tail)
Social support services	0.65	0.73	0.58	p<0.001
	(0.62-0.68)	(0.68-0.77)	(0.52-0.64)	
Adolescent/Substance &	0.52	0.57 (0.48-	0.48	<i>p>0.1</i>
addiction services	(0.49-0.55)	0.65)	(0.44 - 0.52)	1
Community based mental	0.36	0.48	0.29	p<0.001
health services	(0.33-0.39)	(0.39-0.56)	(0.25-0.33)	-
Crisis Response	0.46	0.55	0.41	<i>p</i> =0.016
Team	(0.43 - 0.49)	(0.45 - 0.64)	(0.37-0.46)	-
(urgent community based				
mental health services)				
Psychiatry	0.43	0.49	0.40	<i>p</i> =0.063
(in-house urgent	(0.40-0.46)	(0.41-0.57)	(0.35-0.44)	
psychiatric evaluation				
and interventions)				

*Comparing agreement among physicians versus agreement among allied health professionals.

Simple Cohen's kappa coefficients were computed to measure the level of clinician agreement on HEARTSMAP's management recommendations. Service recommendations are triggered based on a clinician's sectional and domain scores, as well as whether they assessed the youth as already having proper resources in place for a given tool section. These management options show interrater agreement of 0.65 (95% CI: 0.62, 0.68) for social work services, 0.52 (95% CI: 0.49, 0.55) for adolescent and youth health clinics, 0.36 (95% CI: 0.33, 0.39) for community-based mental health clinics, 0.46 (95% CI: 0.43, 0.50) for crisis response, and 0.43 (95% CI: 0.40, 0.46) for psychiatric consultation. Mean interrater agreement on sectional scores, domain scores, and triggered-recommendations, within and between clinician groups are reported with 95% confidence intervals in Tables 2.4.2, 2.4.3, 2.4.4.

Compared to allied health workers, physicians showed significantly higher agreement on 'Alcohol & drugs' and 'Abuse' sections, as well as 'Social' domain scores (p<0.001) and referral to social work services (p<0.001). Allied health workers had significantly greater agreement for 'Thoughts & anxiety,' 'Sexual health,' and 'Mood & behavior' (p<0.05). Physicians had significantly higher kappas for two of the three psychiatric service recommendations (outpatient mental health clinics and crisis intervention). However, allied health workers showed greater agreement for psychiatric domain scores (p=0.026).

2.5 Discussion

Apart from HEARTSMAP, there are few known clinician-administered, digital, and broad-based psychosocial assessment tools for youth, designed exclusively for the ED. In the current study, HEARTSMAP's interrater agreement is evaluated using diverse physicians and allied health workers who scored a set of fictional vignettes of varying ED psychosocial healthrelated presentations. Promising evidence is shown for the tool's interrater reliability, with substantial and moderate to almost perfect overall sectional and domain scoring agreement and fair or above agreement on all service recommendations. This study also saw the participation of a diverse sample of clinicians (Table 2.4.1), who are typically seen working collaboratively to provide integrative ED care.

Quadratically weighted kappa coefficients measure agreement adjusting for chance and clinician disagreement. Inter-professional agreement did not significantly differ on 'Home,' 'Education & activities,' 'Safety,' and 'Professional & resources' sections. Physicians agreed more on 'Alcohol & drugs' and 'Abuse,' while allied health workers displayed greater agreement on 'Relationships & bullying,' 'Thoughts & anxiety,' 'Sexual health,' and 'Mood & behavior' sections. Applying the hospital anxiety and depression scale (HADS)²⁰⁶ to a sample of adolescents with recent cancer diagnoses, Hedström et al. (2006) found that nurses were more sensitive in rating distress arising from psychosocial factors, while physicians were more sensitive toward physical distress. While levels of agreement in the current study were uniformly high, Hedström et al.'s observations may help to explain the agreement seen in the current study. For example, physicians may be more attune to the presence or absence of treatment-related problems such as alcohol and substance misuse, or signs of abuse, and more consistently score the severity of such concerns. Nurses and other allied health workers who more frequently and closely interactions with patients may be more attuned to the patient's' overall quality of life, including mood, relationships, and thoughts. Consequently, these clinicians may assess concerns in these areas more consistently. Ongoing HEARTSMAP validation is necessary, comparing rater scoring against patient's discharge diagnosis and disposition outcome (discharge or admission to inpatient), to ensure the observed consensus is accurate.

Other paediatric psychosocial assessment tools have reported good interrater reliability among clinicians from varying disciplines, some of these tools include the Health of the Nation Outcome Scales for Children and Adolescents (HoNOSCA), Global Assessment of Psychosocial Disability (GAPD), and the Children's Global Assessment Scale (CGAS).²⁰⁷ However, the tools above have yet to be evaluated in emergency settings. Moreover, such tools focus explicitly on assessment and do not offer clinicians with emergency disposition guidance or follow-up care to recommend to families. In this regard, the closest instrument to HEARTSMAP is HEADS-ED, one of the only known tools explicitly designed for ED visiting youth. Cappelli et al. (2017) compared inter-professional agreement between crisis intervention workers and paediatric emergency physicians in screening a sample of 140 patients using the HEADS-ED.²⁰⁸ Scores on HEADS-ED lead to an ordinal outcome: patient requires no, non-immediate, or immediate action. For items related to psychiatric disposition from the ED, reported ICCs for HEADS-ED were 0.529 for Suicidality, 0.208 for Emotions and behaviors and 0.292 for Discharge resources. Agreement on representative HEARTSMAP sections was generally higher, which can be attributed to differences in the methodological and statistical approaches used. In HEADS-ED study, clinicians applied the instrument to youth presenting to the ED with mental health-related complaints. However, the use of clinical vignettes yield similar results that of a standardized patient, and clinician responses to vignettes generally reflect their response to real-world interactions.^{207,209,210}

This study was not without limitations. Quintile agreement analysis showed no significant learning curve in clinicians' application of HEARTSMAP to fictional vignettes. However, the order in which vignettes were completed, and how diligently or distractedly assessors approached cases was not controlled, which could influence agreement seen over time.

Additionally, use of vignettes prevents reviewers from seeking clarification of clinical details and does not allow investigation of how the information gathering (e.g., clinician interview with the patient using HEARTSMAP) component of a clinical encounter influences interrater reliability. Of the 16 clinician evaluators, two had lower agreement on the five service recommendations. Both outliers were ED physicians, with one spending approximately half the amount of time (5-hours) evaluating the 50 vignettes, compared to a median of 10-hours spent by other clinicians. Interestingly, an exploratory sensitivity analysis excluding these outliers showed that scoring and recommendation agreement were nearly unchanged. With HEARTSMAP implementation in British Columbia EDs and utilization by more clinicians, the tool's reliability and validity may not be significantly affected by outliers, which can be expected to arise in the larger ED clinician population. Though fair interrater agreement was observed on tool recommendations, it should be noted that entries were not forced for the binary scale (present or not) measuring existing services in place in each tool section. There were instances where clinician evaluators left this scale empty, which affected agreement on recommendations, as how clinicians scored this section would trigger different service referrals, in accordance with the tool's decision-making algorithm. Moreover, the service options raters had to choose from, in scoring youth's existing resources, were generic and lacking descriptors, which might have introduced additional challenges for the evaluators, concerning their interpretation of response options. The most up-to-date version of HEARTSMAP, being implemented in community EDs across British Columbia, avoids these issues by forcing clinicians to answer to whether more specific services are already in place for patients, on specific tool-sections. Since the completion of this study, a mobile version (http://openheartsmap.ca) has been developed for expanded online tool access to clinicians outside British Columbia.

2.6 Conclusion

HEARTSMAP shows promise as a reliable instrument that provides a standardized and broad-based mental health assessment that can be used by a diverse range of ED clinician types.

Chapter 3: Study 2—Developing and evaluating MyHEARTSMAP

Title: Development and evaluation of MyHEARTSMAP: A psychosocial self-assessment tool for youth and families

3.1 Abstract

Objectives: To develop a self-administered digital youth psychosocial assessment and management tool (MyHEARTSMAP) and evaluate the interrater reliability when applied to a set of fictional cases by a community-based sample of youth and parents.

Methods: A multi-phase, multi-method study was conducted. In phase one, focus group sessions with youth and parents (n=38) were used to inform tool development, through an iterative modification process. In phase two, a cross-sectional study with youth and parents (n=30) participating in two rounds of evaluation (15 participants in each) was conducted to obtain assessments on a set of 25 fictional cases.

Results: MyHEARTSMAP displays good face and content validity, as supported by feedback from youth and parent focus group participants, with participants in later sessions suggesting no new tool modification. Overall the tool has substantial to excellent interrater agreement for all ten psychosocial sections (κ =0.76 to 0.98).

Conclusions: Study findings show that MyHEARTSMAP is an accessible and interpretable psychosocial assessment and management tool that can be reliably applied by a diverse community sample of youth and parents. Results from this study have informed further investigations of the acceptability and feasibility of universal mental health screening using MyHEARTSMAP in the emergency department.

3.2 Introduction

Approximately 12-23% of Canadian and American youth are affected by mental health conditions (e.g., depression, anxiety) each year.^{211–213} Youth whose conditions go unidentified may find themselves in situations where acute psychiatric stabilization or support are necessary, warranting a crisis-driven emergency department (ED) visit.^{92,94} The ED has become a primary point of mental health care for youth struggling to navigate community-based care, half of whom will have had no prior connection to mental health resources.⁵⁶ Also, substantial proportions of youth presenting with physical complaints to the ED have been shown to screen positive for at least one previously unrecognized or unmanaged mental health condition.^{145,149–151} These conditions may not only complicate diagnosis and treatment of physical complaints,²¹⁴ but can also increase utilization of emergency medical services.²¹⁵

Early detection of mental health conditions can give families more prompt access to appropriate levels of care, potentially improving overall health outcomes and utilization of services.¹²⁷ The American Academy of Pediatrics' Task Force has recommended universal screening for mental health conditions amongst youth,⁹⁶ however, this has yet to be implemented effectively. In the ED, youth volume is rising for those with and without mental health concerns as their primary visit reason.^{56,57} This coupled with the ED's unique access to vulnerable populations,^{172,216} and ability to manage cases with acute and severe screening results, makes it a promising venue for universal screening.²¹⁷

An estimated 40-50% of Canadian and American pediatric ED visits are made for lowacuity complaints, similar to those seen in the primary care setting.^{142,143} This may result from primary care service unavailability, a need for care outside primary clinic hours, and caregivers lack of knowledge on what constitutes an emergent concern.¹⁸³ As a result, ED-based screening

efforts are positioned to capture a range of physical complaint severity, from mild or no physical distress to those with severe physical health issues. Screening tools may identify mental health issues acting synergistically with youths physical conditions (e.g., exacerbating physical issues or arising from them),^{5,214,218} in addition to mental health issues that may not be associated with youth's physical conditions in a clinically meaningful way.

Implementation of universal screening interventions is often hindered by ED clinicians' inadequate training in assessment and care of mental health conditions,¹⁸⁶ time constraints,^{78,168} challenges integrating these interventions into existing practices,^{25,26} limited resources (inpatient beds, outpatient services), and awareness of available community-based resources.^{27,28} Introducing an online self-assessment can help reduce the reliance and screening burden on clinicians and minimally impact ED flow.⁶⁷ Moreover, youth may also prefer disclosing personal and sensitive information over an electronic interface versus face-to-face interaction.¹⁷¹ Digital screening offers privacy, time to effectively articulate concerns, and provides patients with a sense of control over managing their well-being without clinician judgement.¹⁷⁰ As a less timeand resource-intensive approach,^{219,220} electronic self-assessment may potentially facilitate screening uptake in the ED and other health settings. In implementing an adolescent behavioural health screen in the pediatric ED, Fein et al. (2010) reported an increased identification of hidden mental health concerns and demonstrated the use of a routine self-screening tool in the ED. With an uptake rate of 33%, the study noted barriers to screening acceptability such as patient's concern that clinicians may be unable to handle their personal information with cultural sensitivity.²²¹ In their previous work, the authors also noted a need to provide families with more details about screening results and improve interpretability and patient's acceptance of a service referral.²²² Complementing screening with service management options to accompany screening

results may address such concerns. Furthermore, tools that have integrated a process of patient engagement in their development may also be more meaningful to those completing them.²²³

Evaluating the interrater reliability of such instruments is particularly important, as evidence suggests that parents proxy-reporting and youth self-reporting can be inconsistent.²²⁴ To ensure optimal use of mental health tools intended for universal screening, it is essential they can be reliably used by both youth and parents, in a multi-information assessment approach. Either informant alone, may not be able to sufficiently capture youth's underlying psychosocial concerns and the contexts they are displayed (e.g., home, school).¹⁷⁷

Currently, there is no comprehensive, digital psychosocial self-assessment tool for use in the ED, with established psychometric properties. To address this need, this study's purpose was twofold: (1) to use an iterative approach to modify a psychosocial emergency assessment and management guiding tool currently used in the ED,^{101,225} for use as a self-administered online assessment by youth and family members (MyHEARTSMAP), and (2) to evaluate the reliability of MyHEARTSMAP for universal screening purposes in the ED.

3.3 Methods

3.3.1 Design

A multi-phase, multi-method study was conducted. In the first phase, qualitative methods were used to develop MyHEARTSMAP, a youth and family version of HEARTSMAP, which is a clinical, psychosocial emergency assessment and management guiding tool. Focus groups with youth and parents in phase one were held to establish tool content and face validity,²²⁶ and ensure tool structure (e.g., format, content ordering), readability, and content were appropriate for youth and families. In the second phase, MyHEARTSMAP's interrater reliability was evaluated. A cross-section of youth and parents was engaged to evaluate 25 fictional clinical vignettes

describing a variety of pediatric mental health presentations, on a broad spectrum of psychosocial issues and ranging concern severity, to establish interrater reliability. This study was reviewed and approved by the University of British Columbia Children's and Women's Hospital ethics review board (H16-00876).

3.3.2 Recruitment and Setting

Several modes of study promotions were used to recruit a convenience sample of participants (n=68), including support from Family Smart, a mental health youth advocacy non-profit organization. Additionally, study flyers were put up at the BC Children's hospital, as well as postings on the study's and non-profit partner's social media platforms (e.g., Facebook, Twitter). Youth with a severe overall disability and youth and parents unable to communicate in English were excluded from the study. The size of the convenience sample in phase two was based on an intraclass correlation (ICC) power analysis, to which quadratically weighted kappa statistics are equivalent.²⁰⁰ Analysis was performed using PASS sample size software (NCSS LLC, Kaysville, Utah). A sample size of 30 parent and youth subjects each scoring 25 cases, achieves 80% power to detect a quadratic kappa of 0.60 (substantial agreement) under the alternative hypothesis, when the quadratic kappa value under the null hypothesis is 0.42 (moderate agreement), using an *F* test with a significance level of 0.05.^{227,228} In phase two, a maximum of one youth and one parent was recruited from the same household.

3.3.3 Instrument

The development of MyHEARTSMAP involved adapting the clinical HEARTSMAP tool, which served as a template, into a lay version for youth and their families to use. The clinical tool has ED clinicians report on ten psychosocial sections: Home, Education, Alcohol & drugs, Relationship & bullying, Thoughts & anxiety, Safety, Mood, Abuse, Professional resources. These sections map to five general domains: Social, Functional, Youth health, Abuse, Psychiatry. For each section, concern severity is measured on a 4-point Likert-type scale from 0 (no concern) to 3 (severe concern), and level of support already accessed is measured on a separate 2-point dichotomous scale (yes or no). Input from both these scales feeds into a built-in algorithm that triggers appropriate service recommendations and time frames in which youth should access them.^{21,22} In the concern severity scales, each option has 2-3 descriptive statements that expand on the conditions of that score, to help youth and parents decide on the most appropriate response for them.

3.3.4 Study procedures

3.3.4.1 Phase One Focus Groups

Eleven 60-minute focus groups were held with up to five youth per group (total seven focus groups) and three parents (total four focus groups). Parent and youth groups were held in four sets of separate but simultaneously occurring sessions. Three more sessions were conducted with just youth. Smaller but numerous focus groups were used to facilitate in-depth discussion, and to gain more varied input.⁴¹ Focus groups took place in seminar rooms at the BC Children's Hospital.

All sessions followed the same structure, and all participants had the opportunity to review the tool and inform its modification. The first youth and parent focus groups reviewed a version of the clinical tool that the research team expanded on to clarify medical jargon and provide additional scoring explanations (version 1). Feedback and modifications made following this first version of MyHEARTSMAP and subsequent versions are summarized in Table 3.4.2. Tool modifications were made after each set of simultaneously occurring youth and parent sessions (versions 2-5). Participants in each session were given the most up-to-date version of MyHEARTSMAP to review. The last three groups were with youth only, and modifications were made after each of these sessions (version 6-8). Figure 3.3.1a provides a schematic representation of each MyHEARTSMAP version and their associated focus group sessions and participants.

Focus groups had a moderator that introduced participants to the tool's overall purpose and thoroughly reviewed its ten psychosocial sections using Microsoft PowerPoint, and a research assistant that took comprehensive notes. At the beginning of each session, the moderator first went over the clinical HEARTSMAP tool, gave a rationale for its use in the ED, summarized the study's purpose, and reviewed critical points on the consent form (e.g., withdrawal, privacy). Questions posed during focus groups sessions are summarized in Table 3.3.1.



1b. Phase two interrater evaluations



Figure 3.3.1. Schematic diagram showing the process of iterative modification that MyHEARTSMAP underwent in phase one (1a) and phase two (1b), with corresponding tool versions, sessions/rounds, and participants involved.

Guiding questions	
For each question	 Does this question make sense to you? What can we do so that you or other kids [or parents]* your age: 1) understand these questions better and 2) are willing to answer them?
Overall	3. How would you rephrase the question so that it makes more sense to you?4. What could we be missing here that is important when we think about a young person's [insert section, e.g., "home environment"]?
Scoring criteria	
For each option	 Does this scoring option make sense to you? What are some suggestions you had to improve this scoring option? How could you rephrase this action so that it makes more sense to you?
Overall	 How could you reprints this option so that it makes more sense to you? Do you think kids your age [or other parents] would be able to fit themselves [or their child] in one of these scoring options? Could you describe if and how they might have trouble doing so? What could be changed so that other kids [or parents] can more easily select one of the
General	scoring options?

- 10. Tell me your overall impression of the tool?
- 11. What are some of the most important changes we need to make to the tool so that other kids and their parents can use it?
- 12. Is there anything that we have not already touched on that would like to talk about?

*Changes made to the questions for parent focus groups are provided in brackets

In each session, participants went through each tool section, and reviewed the section's guiding questions, along with the severity and resource scoring scales, and their descriptors for each response option. For each tool section, moderators asked participants open-ended questions assessing their understanding of tool components, whether they felt the sections were important to them or youth their own age (or other parents), and if they could confidently place themselves (or their child) on the scoring scale. Participants then brainstormed ways the tool could be improved for comprehension and ease-of-use by other youth and parents. Each session ended with all participants applying the MyHEARTSMAP version they reviewed to three fictional vignettes. This allowed any changes in interrater agreement to be noted with each round of tool modification. They completed the first case as a group; during review of the second case participants could ask questions, and the final case was completed independently. The first two cases were meant to familiarize participants to using the tool, so only responses from the last case were retained for analyses, as these scores most closely reflect their ability to assess cases using the tool independently. Tool modifications were made after each set of simultaneously occurring youth and parent focus groups, as shown with version 2-5 of MyHEARTSMAP in Table 3.4.2. Three additional focus groups were held with youth participants, and tool modifications were made following each of these sessions. resulting in versions 6-8 of the tool.

3.3.4.2 Phase Two Interrater Reliability Evaluation

Participants were recruited to complete the MyHEARTSMAP on 25 fictional clinical vignettes, to evaluate the interrater reliability of the final phase one tool version. This equally provided participants a standardized and complete psychosocial history, to focus the evaluation of inter-rater reliability on their ability to score the severity and acuity of psychosocial issues using the tool, rather than how reporting-related issues (e.g., social desirability bias) may impact

agreement. Vignettes were used describing a range of pediatric mental health-related visits to the ED, from no concern to severe psychosocial issues.^b An emergency pediatrician and child and adolescent psychiatrist developed vignettes informed by a chart review of clinical presentations to the ED and their own clinical experiences. Cases then underwent expert review by emergency clinicians including ED nurses, mental health nurses, counsellors, social workers, and general emergency physicians, to ensure clinical accuracy and case-mix. Medical and research trainees reviewed and modified vignette to ensure a lay population could understand them.

Individual phase two participants initially completed a 45 to 60-minute telephone or inperson training session with a research assistant before reviewing vignettes. Training included a 3-minute instructional video, and a PowerPoint presentation overviewing MyHEARTSMAP sections, scoring guidelines including severity and resource scoring options, and application to fictional cases. Following the video, participants completed 2-3 training cases, scoring tool sections, discussing score selections, and asking for additional clarification or feedback from the research assistant if needed. Upon successful training completion (i.e., participants indicated that they felt confident using the tool), vignettes were emailed to them in sets of five, to be completed remotely at a self-directed pace. Youth were required to have parental supervision, as confirmed by their parent or legal guardian during the consent process. All vignette responses were captured in REDCap,⁴² an online survey system. To ensure participants did not complete cases with unreasonable speed (e.g., scored randomly, finished cases within 30-seconds), REDCap's activity logging feature was used to monitor duration spent on cases. After completing the first ten (warm-up) cases, participants received a standardized email highlighting general close-

^b Greater detail on vignette development can be found in the methodology section of chapter two.

reading strategies (e.g., do not skim through the vignette, read all scores before selecting, use a dictionary or ask a parent if a word does not make sense in the vignette).

The above procedure was carried out in two separate, consecutive rounds of evaluation, with equal proportions of youth and parents between the two rounds evaluating the vignettes, as shown in figure 3.3.1b. Between the first and second round, tool and vignette feedback that participants provided were aggregated, reviewed, and incorporated by study investigators, into the tool version and vignettes that participants in the second round used. These changes allowed further refinement of vignette (e.g., reduce medical jargon, acronyms) and tool (e.g., grammar, word choice, the detail in descriptive statements) understandability, to improve the consistency with which youth and parents could apply them. A paper version of the latest MyHEARTSMAP tool can be found in Appendix C.

After all phase two youth and parents completed their assessments of vignettes, an email was sent inviting them to participate in a brief phone-call, for a research assistant to collect demographic information on whether they identify as a visible ethnic minority or Aboriginal person, as defined by Statistics Canada.²²⁹ Participants age and their experience of mental health concerns in the past (with or without a diagnosis), were also collected. Phone calls were optional, and if there was no response after one week of the first email, a second (and final) email was sent. Participants were informed that non-response after the second email would be assumed as their refusal to share this information. For all youth participants, a parent or legal guardian was required to agree to the call and be present to supervise their child. Separate scripts were used for parent and youth phone calls and can be found in Appendix D.

3.3.5 Analytic approach 3.3.5.1 Focus groups

Qualitative content analysis

Phase one focus group sessions were held until no additional constructive feedback or tool modifications were proposed.²³⁰ An exploratory qualitative inquiry was conducted, using the approach to latent content analysis outlined by Mayan (2016).²³¹ Transcripts were first coded, each one was closely read, and any comments made about MyHEARTSMAP or proposed tool modifications were highlighted and extracted into a Microsoft Word document. Excerpts were assigned a code, and similar codes were later collated together into categories. Internal homogeneity was assessed to ensure that all coded text "fit" within their assigned category, through this process subcategories posing distinct perspectives and ideas were identified. The relationship between categories or external homogeneity was examined to ensure they were both clear and distinct. Given this inquiry's practical aim of gauging how best to modify the MyHEARTSMAP for the end-user, theme develop may not be appropriate. It was established a priori that sessions would focus on tool usability, which is the overarching idea that interrelates all categories and subcategories. Therefore, categories were set as the highest level of abstraction. Coding and categorizing were all on-going and done circularly after each round of focus groups.

Test case

The independently completed test case in phase one was used to assess whether scoring consistency changed with iterative tool modifications by comparing participants' average percentage agreement for tool sections and domains. For youth participants, average agreement was compared between the first and second halves of focus groups, a Fisher's Exact test was performed to check for significant differences. For parent participants, only average agreement overall focus groups could be calculated, due to the small sample size. A non-parametric Chi-Square test was performed, to see if overall agreement varied significantly across the ten

MyHEARTSMAP sections and whether participants found certain sections more difficult to score.

3.3.5.1 Interrater Reliability Evaluation

In each round of interrater testing, quadratically weighted kappa statistics were used to measure the overall average interrater agreement on tool sections and domains, of all participants.^d Subgroup analyses were conducted in each round, measuring section and domain agreement specifically among participating youth and parents. Depending on whether overall or sub-group agreement was being measured, kappa values were computed for all or subsets of rater pairs (e.g., youth-parent, youth-youth, parent-parent), and the mean of these pairwise kappas was used as an index of agreement.^{200,201} Quadratic kappas allow for the consideration of chance agreement and factor in the degree of disagreement between raters.²³² Simple Cohen's kappa was used to measure agreement on tool-triggered recommendations, which followed binary scoring. Statistical comparisons of kappa values between or within each round of evaluation were carried out using Welch's t-test, Chi-Square test, and Fisher's Exact test, with a level of significance set at p=0.05. Microsoft Excel 2010 Data Analysis Toolpak (Microsoft, Redmond, Washington) and R software (R Foundation for Statistical Computing, Vienna, Austria) were used to conduct the analyses.

3.4 Results

3.4.1 Focus groups

In phase one, 38 participants were recruited into 11 focus group sessions, including 9 parents and 29 youth. Among these, 16 were youth-parent dyad members, and the remaining 22

^d The rationale for this described approach to analyzing interrater agreement is more thoroughly discussed in the methods section of chapter 2.

participants were the sole participating members of their household. Females made up 71% of the overall sample. The median age for participating youth was 16.0 years. All participants had some lived experience with mental health concerns in the past (e.g., their own, family member, friend), and resided in British Columbia, Canada; additional details are summarized in Table 3.4.1 Qualitative content analysis revealed two categories—the "approachability" (covering relatability and accessibility) and "interpretability" of MyHEARTSMAP, which are summarized in Table 3.4.2. A temporal trend was seen in the identified categories, with approachability highly focused on in earlier sessions, and interpretability more discussed in later sessions.

3.4.1.1 Approachability of MyHEARTSMAP

Youth and parents evaluating version 1-2 of MyHEARTSMAP (sessions 1-4) as shown in Table 3.4.2 stressed the importance of being able to answer tool items comfortably, honestly, and without judging themselves or being judged by others. Participants reviewing version 1 (session 1 and 2) felt they would hesitate from choosing a scoring option labeled as "major concern." In response to this, the labels for the Likert scale were changed to only include ordinal, 0-3 numbering and labels of "no concern," "mild concern," "moderate concern," and "severe concern" were removed. However, the tool still had scoring descriptors for each scoring option, so that participants could understand the general severity of each score.

Additionally, participants reviewing version 1 (session 1 and 2) felt that sometimes a score could not entirely capture or describe their situation, because only one or two of the scoring descriptors applied to their situation. An "or" was introduced between descriptive statements, within each scoring category, to allow greater reporting flexibility. Participants felt the addition of "or" helped them more comfortably make a score selection. Both those reviewing version 1 and 2 (session 1-4) suggested making the tool inclusive of youth from different

lifestyles and backgrounds, such as "homeschooled youth" and "different kinds of romantic relationships." Versions 3 and onward showed no new feedback concerning how well youth and parents felt they, their peers, or their children could relate to the tool and how accessible it would be for them to use it.

3.4.1.2 Interpretability of MyHEARTSMAP

In reviewing versions 3-6 of the tool, participant's feedback shifted from its underlying content to specific language and terminology. Youth reviewing version 3 (session 5) suggested some words might have multiple meanings; therefore, terms with multiple common meanings were replaced. On version 4 (session 7), participants noted that youth might not always understand idioms, so these were removed to make the tool more literal. Additionally, session 7 participants perceived idioms and terms such as "contraception" and "consensual" difficult to understand, especially by younger children and families who spoke English as a second language, so the term was changed to "protection" in this specific instance. Most comments on versions 5-7 (sessions 9-11), which were reviewed by only youth, were re-affirming of prior changes. Youth described the tool as "easy to understand" and that it "makes sense."

 Table 3.4.1. Demographic characteristics of study participants in phase one (focus groups)

 and two (interrater session).

	Phase one:	Phase two: Interrater
	Focus group sessions	sessions
Total N (%)	38	30
Sex (female)	27 (71.0%)	21 (70.0%)
Parents	9 (23.7%)	10 (33.3%)
Youth	29 (76.3%)	20 (66.7%)
Age (median)	16.0	14.5
Ethnicity		
Caucasian	19 (50.0%)	13 (43.3%)
Visible Minority [*]	19 (50.0%)	3 (10.0%)
Aboriginal	-	1 (3.30%)
Refused to answer	-	13 (43.3%)
Past mental health experiences ^{**}		
Yes	38 (100%)	5 (16.7%)
No	-	12 (40.0%)
Refused to answer	-	13 (43.3%)

*A visible minority, as defined by Statistics Canada are "persons, other than aboriginal peoples, who are non-Caucasian in race or non-white in colour." ²²⁹

**Participants were asked whether they experienced mental health concerns in the past, regardless of a clinical diagnosis.

Theme	T	ool version & Sample Feedback*	Tool Modifications
Approachability	1	The title of the answer options in each section ('no', 'mild', 'moderate', 'severe' concern), imply judgment I felt embarrassed to choose 'major concern'	Scoring descriptors were limited to an ordinal number scale (0-3)
		Statements need to be more inclusive, for example the 'Education' section should include homeschooled kids	Scoring descriptors in the 'Education' section were updated to include homeschooled youth
		Some kids may feel uncomfortable choosing a scoring option, because the category may have details that are not important to them, for example someone may have anxiety but no mind tricks	An 'or' was placed between statements in each scoring description, so youth do not need to meet all criteria mentioned to make a score selection
		Some words are confusing, when I read 'caregiver' I think about a housemaid or living support staff	Terminology was simplified (e.g. 'caregiver' was changed to parent/guardian)
	2	There is a sense of judgement associated with certain words/statements (e.g. good grades)	Terminology with a potentially judgment connotation was removed (e.g. changed 'good grade' to 'passing grades)
		Kids may perceive a specific behavior to be acceptable if it is put in the zero-score category	Descriptors in the zero category were reviewed to ensure they represent age- appropriate and acceptable behavior
		In the 'Relationship and bullying' section, it is missing romantic partnerships kids may be in	Romantic partners were included in the 'Relationship and bullying' section
		The 'Professionals and resources' section, should distinguish youth who have 'long-term' support from those who sought occasional or one-time help	Long-term mental health support was explicitly mentioned in the 'Professionals and resources' section
Interpretability	3	Some of the words used in the tool have other meanings (e.g. trigger)	Terminology with other common meanings were removed and replaced
		The scoring descriptions are too verbose	Sentences were made shorter, less wordy, with emphasis on key points
		Some of the vocabulary is too advanced for younger kids to understand (e.g. consensual, recreational, abuse)	Complex language was simplified (e.g. consensual was changed to 'agreed to'; abuse was changed to 'threatened or hurt')
		There need to be more examples to make some of the statements easier to understand, like giving broad examples where it says, "practicing steps to end one's own life", so it is clear this referring to suicide	Examples were added to further clarify complex issues, for example "for practicing steps to end one's life", examples such as "holding rope around neck" were added
	4	Where and how would the tool be used? And who would see the results?	
		Idioms may not be understood by other kids (e.g. 'out of the blue')	Idioms were removed
		Some of the vocabulary is challenging (e.g. contraception)	The term 'contraception' was changed to 'protection'
		This tool is very exciting	
	5	The word 'isolated' may be difficult for some participants to understand	The term 'isolated' was changed to 'alone'
		Overall, it is really well-written and easy to understand	
	6	The tool makes sense and is easy to understand	
	0	In the 'Palationship and bullying' section 'fighting' with a romantic	In the 'Pelationship and bullying" section the term 'fight' was changed to
		partner could be verbal or physical	'argue'
		The word 'harm' may be difficult for some participants to understand	The term 'harm' was changed to 'hurt'
	7	Everything was really clear and straightforward	

Table 3.4.2. Summary of categories, feedback, and tool modifications from phase one parent and youth focus group sessions.

*Sample feedback corresponding to the specific version of MyHEARTSMAP that participants reviewed.

3.4.1.3 Test case

Overall agreement of all participants on MyHEARTSMAP sections, averaged from all focus groups, ranged from 55% (Safety) to 97% (Abuse), reported in Table 3.4.3. The scoring agreement did not significantly differ between the first and second half of youth focus groups (Fisher's Exact Test, p > 0.05), however lower score variability was observed in the second half of sessions. Scoring distributions showed similar agreement patterns between youth and parents. Across sections and domains, scoring distributions varied significantly (Chi-square, p < 0.0001).

Table 3.4.3. Percent agreement (95% confidence intervals) on MyHEARTSMAP sectional scoring when applied by focus group parents and youth (N=38) to one fictional vignette completed independently during phase one of the study.

	All Participants (N=38)	Yout (N	Parents Only (N=9)	
Tool section:		First half (N=17)	Second half (N=12)	<u>`</u>
Home	76 (61-87)	82 (59-94)	92 (65-99)	56 (27-81)
Education & activities	63 (46-77)	47 (26-69)	75 (44-91)	78 (45-94)
Alcohol & drugs	92 (79-97)	94 (73-99)	92 (65-99)	89 (57-98)
Relationships & bullying	95 (82-99)	88 (66-97)	100 (76-100)	100 (70-100)
Thoughts & anxiety	74 (58-85)	59 (36-78)	83 (55-95)	89 (57-98)
Safety	55 (40-70)	53 (31-74)	83 (55-95)	44 (19-73)
Sexual health	92 (79-97)	88 (66-97)	100 (76-100)	89 (57-98)
Mood	95 (82-99)	94 (73-99)	100 (76-100)	89 (57-98)
Abuse	97 (87-100)	94 (73-99)	100 (76-100)	100 (70-100)
Professionals & services	82 (67-91)	82 (59-94)	75 (44-91)	89 (57-98)

*Agreement was separately measured for youth in the first and second half of focus group sessions, each using a different, modified version of MyHEARTSMAP.

3.4.2 Interrater evaluation

In phase two, 32 participants were recruited and trained, however, 2 youth withdrew after training, before beginning independent case review, leaving 10 parents and 20 youth. Included in study analyses were 9 participants (5 youth and 4 parents) who were part of phase one, 10 youth-parent dyad members, and the remaining 20 were the only participating members of their family. Females made up 70% of the overall sample. The median age of youth was 14.5 years. Only 57% responded to questions relating to ethnicity and lived mental health experience. Among respondents, 10% identified as visible minorities, and 17% identified as having past mental health experiences. Participants came predominantly from the Greater Vancouver region in British Columbia, Canada; see Table 3.4.1 for other demographic information.

During this phase of the study, MyHEARTSMAP was only modified for minor grammatical improvements without any changes to its content. Overall, high weighted kappa values were found, displaying almost perfect or perfect agreement in both rounds (Table 3.4.4). However, statistically significant (Welch's t-test, p < 0.001) improvements were seen in nearly all the kappa values calculated for each section between rounds 1 and 2 when the additional tool and vignette modifications were made. Clinically meaningful and statistically significant improvement was observed for 'Professionals & services,' where agreement level rose from slight to substantial, or a kappa difference of nearly 0.40 between the two evaluation rounds. Higher sectional kappas in round 2 were seen when stratified by youth and parents; domain scores and tool-triggered recommendations also improved significantly (p < 0.001). Agreement in the second round, with participants using the most up-to-date version of MyHEARTSMAP, ranged from 0.76 (Professionals & services) to 0.98 (Sexual health) as shown in Table 3.4.4

	All Participants (N=30)		Youth Only (N=20)		Parent Only (N=10)		
MyHEARTSMAP	Session 1	Session 2	P-value*	Session 1	Session 2	Session 1	Session 2
section							
Home	0.83	0.89	p<0.0001	0.81	0.87	0.85	0.90
	(0.81-0.84)	(0.88-0.90)		(0.79-0.83)	(0.85-0.89)	(0.83-0.87)	(0.89-0.92)
Education & activities	0.79	0.81	<i>p>0.05</i>	0.82	0.80	0.73	0.83
	(0.77-0.81)	(0.79-0.83)		(0.80-0.84)	(0.77-0.83)	(0.66-0.80)	(0.79-0.89)
Alcohol & drugs	0.90	0.98	<i>p<0.0001</i>	0.90	0.98	0.93	0.98
	(0.89-0.91)	(0.97-0.98)		(0.88-0.91)	(0.97-0.98)	(0.90-0.95)	(0.97-1.00)
Relationships &	0.85	0.91	<i>p<0.0001</i>	0.85	0.90	0.84	0.95
bullying	(0.84-0.86)	(0.90-0.92)		(0.83-0.87)	(0.88-0.91)	(0.80-0.87)	(0.93-0.97)
Thoughts & anxiety	0.81	0.88	p<0.0001	0.79	0.91	0.83	0.86
	(0.79-0.82)	(0.86-0.89)		(0.76-0.81)	(0.90-0.92)	(0.79-0.87)	(0.83-0.90)
Safety	0.85	0.85	<i>p</i> >0.05	0.84	0.84	0.88	0.86
	(0.83-0.85)	(0.83-0.87)		(0.82-0.85)	(0.81-0.87)	(0.86-0.90)	(0.81-0.91)
Sexual health	0.86	0.98	<i>p<0.0001</i>	0.87	0.98	0.81	0.96
	(0.83-0.88)	(0.97-0.99)		(0.84-0.91)	(0.97-0.99)	(0.72-0.89)	(0.94-0.99)
Mood	0.80	0.94	<i>p<0.0001</i>	0.79	0.93	0.81	0.95
	(0.78-0.81)	(0.93-0.94)		(0.76 - 0.82)	(0.92-0.94)	(0.74 - 0.87)	(0.93-0.96)
Abuse	0.80	0.95	p<0.0001	0.81	0.93	0.78	1.00
	(0.77-0.84)	(0.93-0.98)		(0.76-0.86)	(0.89-0.97)	(0.61-0.96)	
Professionals &	0.30	0.76	p<0.0001	0.18	0.72	0.58	0.83
services	(0.23-0.36)	(0.73-0.79)		(0.09-0.27)	(0.68-0.77)	(0.47-0.69)	(0.78-0.88)

Table 3.4.4. Quadratically weighted kappa statistics (95% confidence intervals) measuring MyHEARTSMAP sectional

agreement when applied by parents and youth (N=30) to a set of 25 fictional vignettes during phase two of the study.

*Comparing overall sectional agreement between session 1 and 2.

3.5 Discussion

MyHEARTSMAP was developed through an iterative design process to be a psychosocial self-assessment and management guiding application. Face and content validity was found to be excellent in a diverse sample of community-based youth and their families. Participants valued the tool's need to be easily interpretable, approachable for users, reflect different backgrounds and each youth's unique situation, and reduce fears of judgment. The tool displayed strong interrater reliability when applied to fictional cases by youth and parent raters. Weighted and simple kappa values showed substantial to near-perfect levels of interrater agreement across tool sections, domains, and service recommendations. Overall scoring consensus and significant improvements between evaluation rounds provide support for the quality of MyHEARTSMAP assessment data and sources of evidence for tool reliability.¹⁹⁷

Clinician-administered psychosocial assessment tools such as the HEADS-ED and HEARTSMAP are available for use in the ED and have demonstrated good reliability and predictive validity.^{101,181,208,225} However, such tools can be time-consuming for clinicians and youth may be uncomfortable in face-to-face disclosure with clinicians. Although self-screening tools may mitigate such challenges, valid, reliable, and brief tools for youth mental health self-assessment in the ED are lacking. One such tool, the Behavioural Health Screen, has been evaluated for its acceptability and feasibility, however, it was not psychometrically validated explicitly for use in the ED setting. While not specific to acute care, the Patient Reported Outcomes Measurement Information System (PROMIS) group developed parent and youth self-reporting scales to assess physical, mental, and social well-being, for a wide range of clinical and research purposes.²³³ When used by American youth and their parents visiting outpatient clinics for self-reporting, low agreement was found between parents and youth on psychosocial
measures. Linear weighted kappas ranged from 0.25 (Peer relationships) to 0.28 (Depressive symptom and Anxiety subscales).²³⁴ Similar studies, evaluated agreement between parents and youth when using KIDSCREEN-27, a European health quality of life self-reporting tool for routine mental health monitoring and screening in school, home, or clinically-based settings, for healthy and chronically ill youth.²³⁵ The KIDSCREEN-27 version has been broadly validated and shares similar content and tool completion time (5-10 minutes) with MyHEARTSMAP.^{236,237} Across KIDSCREEN-27 studies, inconsistent agreement has been reported, with ICC values for between child-parent agreement ranging from 0.46 (poor-fair) to 0.74 (good).^{238–242}

Variable and generally low agreement between youth and parents on psychosocial subscales, in the studies mentioned above, may reflect inherent tool properties (e.g., response format, item content), or possibly parental misperceptions. Young people can better assess and predict their own experiences of internalizing behaviours such as anxiety and depression compared to parents.^{243,244} Parents as crucial informants may introduce discrepancies in assessing youth mental health status and needs. By providing all raters standardized vignettes on a fictional youth's psychosocial status, the current study eliminated the need for parental inference about their child,²⁴⁵ and found higher levels of agreement that may more closely reflect rater precision in applying and scoring with MyHEARTSMAP. However, agreement comparisons made with PROMIS and KIDSCREEN-27 are made cautiously, given the use of different study populations (e.g., community-based, clinical, stratified) across studies, and the sensitivity of kappa and ICC values to sample heterogeneity and prevalence of mental health conditions.^{246,247} Additionally, different reliability coefficients were used across studies, although quadratically weighted kappas offer practical comparability to ICC values used in KIDSCREEN-27 studies.²⁴⁸ Linear weighted kappa analysis for MyHEARTSMAP scoring confirmed its statistically and clinically higher

agreement, compared to PROMIS psychosocial subscales. The primary outcome measure in these studies was between child-parent agreement, while overall (parent and youth) sectional agreement on MyHEARTSMAP was measured here. However, agreement on MyHEARTSMAP was comparable to the studies mentioned above, as nearly identical overall and among-group kappas were reported in the current study (Table 3.4.4).

This study is strengthened by its methodological considerations for tool administration, using rater training and accountability measures for accurate scoring and improved agreement,²⁴⁹ that are not often seen or reported in reliability testing of other psychosocial measures.²⁵⁰ In developing a similar self-administered psychosocial tool (YouthCHAT), for opportunistic primary care screening, Goodyear-Smith et al. (2016)²⁵¹ also had end-users inform tool modifications before implementation in a rural clinic. While similar positive feedback was received for MyHEARTSMAP's ease-of-use and simplicity, the use of a unique iterative approach allowed the research team to make on-going end-user-informed MyHEARTSMAP modifications to address concerns raised in both study phases, regarding item difficulty and need for age-appropriate language. In demonstrating significantly improved tool agreement between two rounds of interrater testing, further investigation of this approach is encouraged, in relation to tool development and reliability testing. Finally, MyHEARTSMAP's ability to reliably recommend actionable management options for youth presents a novel addition to standard psychosocial self-assessment. Particularly in acute care, as patients receiving and subsequently connecting with mental health care recommendations made in the ED, report greater ED visit satisfaction,⁷⁵ and are more likely to remain connected.²⁵²

The use of note-taking for focus group data collection and not audio-recording discussions was a limitation of this study. Though verbatim session transcripts could not be

produced for data analysis, there was sufficient feedback documentation for MyHEARTSMAP modifications without the stress of audio-recording for participants.²⁵³ An additional limitation was with tool sections (items) mapping to multiple domains (constructs); therefore, Cronbach alpha values were not computed to measure internal consistency as the "tau-equivalence model" assumption was violated, which states each item loads equally onto to a single construct.²⁰⁵ As domain scores and triggered service recommendations reflect the MyHEARTSMAP's decisionmaking algorithm and internal structure, and high agreement here makes a case for internal consistency. Ultimately intended for self-assessment by real patients, the interrater agreement may vary depending on whether it is used for patient or vignette evaluation,²⁵⁴ as evaluating vignettes may oversimplify the psychosocial assessment process. However, vignettes allowed for tool evaluation with a diverse mix of realistic, ED mental health presentations,⁷⁰ and have been previously used in interrater reliability studies.¹⁹⁴ Finally, both study phases were limited to a community sample of youth and parents. Intended for ED use, a prospective cohort study is currently underway at two pediatric EDs in Western Canada to further evaluate MyHEARTSMAP's psychometric properties and assess feasibility and acceptability of screening in the ED. Future research evaluating the tool's test-retest reliability among youth who selfreport with the tool and re-assess over a time period to measure assessment stability, would also further the case for MyHEARTSMAP reliability.

3.6 Conclusion

In a community-based sample, MyHEARTSMAP demonstrates good content and face validity and interrater reliability comparable, if not higher, compared to the psychosocial instruments discussed above. MyHEARTSMAP is now poised for prospective evaluation of its validity in predicting clinician assessed psychosocial status and recommended care, in addition

to serving as an instrument in assessing feasibility and acceptability of universal screening in busy clinical settings, to facilitate early detection and appropriate access to mental health services.

Chapter 4: Discussion, Future Directions & Clinical Implications

4.1 Overview

This thesis presents findings from two studies that extend the utility of a clinical, psychosocial assessment and management tool used in the pediatric ED. The aim of these studies was to 1) evaluate the interrater reliability of a clinical mental health decision-making tool (HEARTSMAP) when used by different ED clinician-types, in diverse acute care settings; 2) adapt the clinical tool into a self-administered version (MyHEARTSMAP) to be used by youth and families; 3) evaluate how reliably a community-based sample of youth and their caregivers can apply the lay tool.

4.2 Key findings

In study one, a cross-sectional, interrater reliability evaluation conducted with (general and pediatric) ED physicians, including a psychiatrist, nurse practitioners, registered nurses, psychiatric liaison nurses, and social workers. Overall, clinicians displayed a high agreement across HEARTSMAP's ten psychosocial sections and four domains, when applied to a range of diverse fictional clinical vignettes. These findings highlight HEARTSMAP's reliable application by ED clinician-types that most often care for youth with mental health issues, in rural and urban settings, and position HEARTSMAP well for wide-scale implementation. Because of the inconsistent completion of the resource scoring scale for each section, lower agreement was seen for tool-triggered service recommendations. In the most up-to-date tool version, clinicians are forced to score all scales to ensure completeness of assessment.

Study two was a multi-method and multi-phased, using a process of iterative modification to develop a self-reporting psychosocial assessment and management guiding tool. Phase one saw the consultation of potential youth and parent end-users, and their feedback

emphasized and oriented around the need for an approachable and interpretable tool. Their satisfaction with the tool helped show its content validity. In phase two, the tool displayed high agreement between and among youth and parent groups, which also improved significantly between the two rounds of evaluation. These findings support MyHEARTSMAP's multi-informant usage, which compared to self- or proxy-reporting can allow for a more thorough representation of youths' psychosocial well-being. According to Dirks et al. (2012), this property also allows health care professionals to see how youth's mental health issues may vary across contexts.

Together, both studies lay the foundations for potentially more routine and widespread psychosocial screening in the ED, enabled by not only different clinicians but also parents and youth, as evidenced by promising interrater reliability findings.

4.3 **Overall strengths**

Several overall common strengths in both studies are discussed here. Sample populations in both investigations reflected the diversity of clinicians and presenting youth seen in acute care settings. In study one, sampling a range of clinicians from different ED centers and regions offers greater generalizability of findings. Similarly, study two saw the participation of youth of various ethnic backgrounds, including youth with and without lived mental health experiences. This was especially useful in the development of MyHEARTSMAP, as it allowed consideration of socio-cultural issues, extending the applicability of the tool to more youth. The iterative approach to tool modification was a methodological strength in chapter 3 and has seldom been described in the context of tool development. This approach allowed collection of tool feedback and modifications from tool users and incorporate these suggestions in a circular process that

allowed continuous refinement. Each set of changes were either consolidated or reworked by subsequent groups of youth and parents.

4.4 **Overall limitations**

Chapter 2 and 3 each describe specific study strengths and limitations; however, several overarching points are discussed here. In both studies, the respective tools were applied to a set of fictional vignettes, which gave raters a clear and thorough psychosocial history, and is not always available to clinicians acutely assessing and managing mental health issues. Compared to real-life interaction, vignettes do not consider the input process of documenting a patient's psychosocial history into the tool, nor do they always reflect the complexity and nuances of real patients and describing complex psychosocial situations. Given the stigma surrounding mental health issues, social desirability response bias may result in underreporting of issues.²⁵⁶ This may be less of an issue with self-screening, as qualitative literature has found the privacy and confidentiality of a self-completed assessment to encourage disclosure.¹⁷¹ Nonetheless, these are nuances the two reliability studies presented here could not take into consideration, and the impact that the psychosocial documentation process may have on interrater reliability requires further investigation.

Evaluating interrater agreement using a weighted generalized kappa statistic, considered chance agreement, the degree of disagreement, and presence of multiple raters. However, kappa values are sensitive to prevalence and bias effects, which can lead to the paradoxes of kappa.^{246,257} Prevalence effects are observed when one scoring category is selected more frequently than any other, and results in an underestimated kappa. Bias effects appear when the marginal distributions between raters are unequal on a case, signifying systematic scoring differences between them, resulting in an overestimated kappa. Multiple individual statistics can

be reported to understand how significant these effects may be and build a stronger case for reliability. For two-rater studies, the Prevalence Adjusted Bias Adjusted Kappa can be computed, however generalized kappa statistics used in multi-rater studies do not allow adjustment for prevalence and bias effects. For studies in chapter 2 and 3, bias effects are unlikely as scoring distributions between raters were mostly balanced, as shown in Appendix E and F. Vignettes were designed to include a range of issues with varying severity for each section, to ensure spread in score choice. As generally high kappa values were seen across both studies, significant prevalence effects are not believed to be at in effect, as there would have been a larger adjustment for chance agreement, resulting in underestimated kappas. The literature also cautions that the dependency of kappa values on trait prevalence can limit its comparability between different studies.²⁵⁸ Interrater reliability comparisons to other instruments in chapter 2.0 and 3.0 are therefore limited and interpreted with this caveat in mind.

Finally, both studies involved the same raters evaluating either a set of ten (chapter 2) or fifty (chapter 3) vignettes. Practice effects can be an issue in such instances, whereby higher agreement is seen because of the rater's prolonged exposure to the tool and improved ability to apply to cases. However, stratified quintile analysis in both studies showed that agreement did not significantly change with each set of five or ten cases.

4.5 Future research

Findings from study one (chapter 2) have since informed HEARTSMAP's wide-scale implementation across 50 emergency departments in three British Columbia health authorities. A retrospective cohort study is currently underway, using a RE-AIM framework to evaluate how effectively HEARTSMAP's has been implemented. Evaluation is focused around the clinician training processes and their subsequent uptake rates, as well system-level outcomes at each site

(e.g., changes in length of stay, return visits, hospitalization rates, psychosocial documentation). These investigations will qualify how effectively HEARTSMAP can be integrated into clinical practice.

Study two findings (chapter 3) showed that MyHEARTSMAP had good content validity and could be reliably applied by a community-based sample of youth. However, more studies are required to evaluate its psychometric properties among youth and parents presenting to the emergency department. Ensuring the accuracy of MyHEARTSMAP assessment data and its tooltriggered service recommendation is crucial before tool implementation in the ED. Subsequent investigations will evaluate MyHEARTSMAP's predictive validity by determining the sensitivity and specificity of triggered recommendations compared against a clinician assessment guided by HEARTSMAP and patient's disposition outcomes (criterion standard).

For MyHEARTSMAP to be a suitable candidate for universal screening in the emergency department, it is necessary to evaluate its acceptability by ED visiting youth and parents and seeing what proportion are willing to participate in screening. A critical issue with clinician-led screening in the ED is the considerable time it takes to complete screening; therefore, feasibility testing is also necessary to evaluate whether self-screening with MyHEARTSMAP effects median ED length of stay, both at the screened patient and department level. Studies have found that completion of a screening tool may not necessarily lead to connectivity with required health services.^{259,260} A follow-up study may show whether tool completion and provided management recommendations affect health resource-seeking behaviours. This would also provide an opportunity to gauge youth's perceptions of recommendations they received during their ED visit, and how they felt about the screening process. Evaluations of MyHEARTSMAP's ED-specific psychometric properties, acceptability, feasibility, and impact on help-seeking are

currently underway in a two-center prospective cohort study at the BC Children's Hospital and Stollery Children's Hospital in Edmonton, Alberta.

Using the MyHEARTSMAP tool as a general template, a population-specific version has also been proposed for young adults in post-secondary settings A recent, large-scale epidemiological study (n=43,780) found that over 20% of Canadian post-secondary students' experience significant depressive symptoms that impair their functionality, over 50% felt overwhelming anxiety, and more than 10% consider suicide.²⁶¹ Standardized approaches to supporting youth are lacking, however their integration into post-secondary health systems may help student's identify and act on areas of concern.²⁶²

4.6 Implications for clinical practice

In further establishing HEARTSMAP's psychometric properties, study one supported the endorsement of HEARTSMAP as the standardized psychosocial intake assessment in the Child and Youth Mental Health and Substance Use Collaborative Emergency Room protocol. This protocol aims to offer standardized care to youth who present to the ED in mental health and substance use crises, by outlining a clear clinical protocol from triage to discharge, to support ED clinicians who may have limited mental health training. As of December 2017, approximately 70% of the 109 ED's in British Columbia are believed to have the protocol in place.²⁶³ A publicly accessible version (openheartsmap.ca) has also been developed and is available to clinicians working in other provinces or territories.

Although investigations are underway to evaluate MyHEARTSMAP's use in the ED, the study described in chapter 3 is a first step in making a case for universal mental health screening and outlining the vital role youth and parent end-users can have in the preliminary stages of tool development.

4.7 Conclusory remarks

This thesis extends a clinical assessment and management tool tested in the pediatric ED, for use by diverse clinicians working in different ED-types, and for self-screening by youth and their parents. The clinical tool has since been implemented on a wide-scale and is being adopted into clinical pathways that are standardizing ED mental health care. While the self-screening tool shows promise, further research is needed and is currently underway to evaluate its use in the ED. This work has also inspired the prospect of other population-specific self-screening tools, tailored toward young emerging adults.

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Appendix A: HEARTSMAP (paper version)

r							
	Is there difficulty or fighting at home between family members?						
HOME	 How do you get along with [guardian/parents/family]? 						
-	 Hov 	/ do you feel about your h	ome	environment?			
Assessment Notes	No	Mild Concerns	Moderate Concerns			Major Concerns	
	Concerns			-		•	
	0	1		2		3	
		Supportive of youth's	th's Unsupportive (parents at risk for			Dysfunctional (parental burn	
		difficulties but some	burn out).		0	ut).	
		conflicts.	Frequent conflicts.		H	lomelessness.	
					IV	lajor conflicts.	
	0	0		0		0	
	Resources:	sources: o Social Supports neither requested nor initiated					
	 Social Supports Involved (resource requested and services initiated) 						
EDUCATION	How is school going for you?						
	Are there any difficulties going to school or staying in class?						
& ACTIVITIES	 What 	at do you do for fun? Has	that c	changed recently?			
Assessment Notes	No	Mild Concerns		Moderate Concerns		Major Concerns	
	Concerns						
	0	1		2		3	
		Struggle to maintain.	F	Performance decline.	Failing / major issues.		
		Difficulty attending.	r	Missing classes / activities.	Not at	ttending.	
		Attends more than misses	s. I	Misses more than attends.	Comp	eletely truant (excluding holidays)	
	0	0		0		0	
	Resources:	 Educational/Activity is: 	sues i	not yet addressed			
		 Functional Plan in Place 	ce (cc	ounselor involved)			
ALCOHOL	• Hov	much is alcohol use a pa	art of	your life?			
	• Do :	you use any substances li	ike m	arijuana? How about any othe	ers?		
& DK003	• Do	ou ever use drugs or alc	ohol t	o feel better or to make a prol	blem g	o away?	
Assessment Notes	No Concer	ns Mild Concerns		Moderate Concerns		Major Concerns	
	0	1		2		3	
		Infrequent.		Regular recreational use.	Bin	ging recreational use.	
		Mild recreational use	e.	Mild substance misuse.	Sul	bstance abuse.	
	0	0		0		0	
	Resources: No detox or rehabilitation services suggested yet 						
	 Substance Use Services in Place (referred and offered) 						
	 Hov 	are things going for you	with f	friends and relationships?			
RELATIONSHIPS&	• Do :	ou have a close person/	group	of people that you can rely or	n?		
BULLYING	• Do :	ou feel teased, bullied, o	r excl	uded by others?			
20221110	• Do	ou have any struggles w	ith yo	ur sexual identity or sexual pr	eferen	ice?	
Assessment Notes	No	Mild Concerns		Moderate Concerns		Major Concerns	
	Concerns						
	0	1		2		3	
		Minor conflicts / bullying	J.	Conflicts / bullying.	Majo	or conflicts / bullying.	
	Struggle to maintain. Negative changes. Lack of relationships. Major dysfunctional relat		Lack	c of relationships.			
			or dysfunctional relationship.				
	O O O Resources: O No support or resources initiated						
		o Educational of Social	Plan I	n Place (school authority or s	ocial w	vorker aware and addressing)	
	• Do y	ou consider yourself som	neone	who worries or thinks a lot al	bout th	e past or future?	
THOUGHTS &	• Do	ou ever experience panie	c / ext	treme fear that comes out of t	he blu	e?	
ΔΝΥΙΕΤΥ	Do you ever have times where you feel your brain is playing tricks on you?						
	• Do 1	ou generally feel safe?					
Assessment Notes	No	Mild Concerns	IIId Concerns Moderate Concerns Major Concerns				
	Concerns		2 3 hts Moderate anxiety or thought High anxiety (impairing				
	0	1			3		
		Anxiety / odd thoughts			High anxiety (impairing /		
		(minimal impact).	problems (strong, but able to power insurmountable).			insurmountable).	
			through). Thought disorder / psychosi			I hought disorder / psychosis.	
		0 0 0 0					
	0	0		0		0	
	ः Resources:	 No psychiatric assess 	ment	or services initiated yet (not y	et refe	rred or on wait list for initial	
	○ Resources:	 No psychiatric assess assessment and no ap assessment and no ap 	ment	or services initiated yet (not y ment in sight)	et refe	rred or on wait list for initial	
	⊖ Resources:	 No psychiatric assess assessment and no ap Care plan in place (CY involved or will be involved or wi	ment opoint (MH,	or services initiated yet (not y ment in sight) Crisis response team, psychia	et refe	rred or on wait list for initial	
	○ Resources:	 No psychiatric assessing assessment and no applicate plan in place (CY involved or will be in	ment opoint (MH, olved	or services initiated yet (not y ment in sight) Crisis response team, psychia shortly, and available in the lo	et refe atrist, o ong ter	rred or on wait list for initial or private counselor/psychologist m irrespective of youth's	

HEARTSMAP GUIDE

SAFETY	 Do you sometimes feel hopeless, or that life is not worth living? In the past few weeks, have you seriously considered ending your life? Have you ever tried to end your life? In the past few weeks, have you thought of harming yourself? In the past few weeks, have you go for the you or your femily would be better off if you were deed? 						
Assassment Notes	In the past rew weeks, have you feit that you or your family would be better off if you were dead? No Mild Concerns Major Concerns Major Concerns						
Assessment Notes	Concerns	Wind Concerns		Woderate Concerns		Major Concerns	
	0	1		2		3	
		Fleeting or improving thoughts. Non-suicidal self injury. Verbal threats to others but no		Passive suicidal i Non-lethal gestur self (suicide pract	deation. es to ticing) or	Formed plan. Lethal gestures to self or others.	
	0		0			Attempt.	
	Resources:	O No plan for current safety concern Safety planning in place AND consistent with current suit				idality/homicidality	
	Are you involved in any sexual activities / not limited to penetration?						
SEXUAL HEALTH	 Do you use any mode of contraception? What of form of protection against sexually transmitted disease do you use if any? 						
Assassment Notes	Do ye	Ou get any counseling about	sexual ne	eaith from a doctor o	or nurse?	Major Concorns	
Assessment Notes	Concerns	Wild Concerns	IVI	oderate Concerns		Major Concerns	
	0	1		2		3	
		Sexually active and safe practice (contraception and STD protected) Stable partner but inconsis use of protection and contraception		artner but inconsiste otection and otion.	nt N p	Multiple partners or no use of protection or contraception.	
	0	0		0		0	
	Resources:	 Sexual health issues not y Has a primary care provid 	yet approa	ached with health ca	re profess	sional lanning addressed	
	• How	would you rate your mood,	with '0' be	ing as low as possi	ble, and '1	10' being perfectly happy?	
BEHAVIOUR	Do you feel down or depressed recently?Do you feel really happy or energetic lately?						
Assessment Notes	No Concerns Mild Concerns Moderate Concerns Major Conc						
	0 1 Mood instability (minor) Dr			2 Depression / irritabil	it.	3	
	A few concerning behav		iours.	rs. Concerning behaviours.		Major behavioral concern.	
	Resources: • No psychiatric assessment or services initiated yet (not yet referred or on wait assessment and no appointment in sight) • Care plan in place (CYMH, Crisis response team, psychiatrist, or private couns involved or will be involved shortly, and available in the long term irrespective adherence)						
ABUSE	To ch To a	hild: Has anyone ever hurt y dolescent: Have you ever ex	ou by touc operienced	ching you in a way y d abuse, either phys	ou didn't l ical, emot	like? tional, or sexual?	
	• To ca	aregiver: Do you have any c	oncerns o	f abuse or mistreatr	nent?		
Assessment Notes	No Concerns Moderate Concerns Maj					Major Concerns	
	0 2 Concern has been raised and reported to the mini Historical concerns. At risk for grooming / victimization.			orted to the ministry		3 Current concern of abuse or neglect / not reported.	
	0		0			0	
	Notification has occurred: o Yes o No						
	• Do y	ou feel that there are people	or places	you can go to for h	elp?		
& RESOURCES	 Who are the people who are working with you on these issues? Does the current plan to help make sense to you? 						
Assessment Notes		No Concerns	Mod	erate Concerns		Major Concerns	
	0 Service plan in place or available. No new outpatient or long term referrals need to be made.		Referre access listed).	2 erred for service, but ess delayed (wait- td).		3 dinal services unavailable, but ary. referred or refusing /treatment.	
		0		0		0	

Appendix C: Example fictional vignette

Demographics: 16-year-old male

Reason for Visit to ED: Patient became unconscious after consuming methamphetamine, beer, and several shots of vodka. Friends called 911.

Home: Patient's biological mother died when patient was seven years old. Father physically and verbally abused him after his mother's death until Ministry of Child and Family Development became involved four years ago. Patient is now in foster care, currently living with his third family (in four years). Current foster parents (of one year) are supportive but unable to control him. They are worried because he will not listen to them and argues when they try to discuss his drug use. Patient stays at friend's house once a month due to arguments. A social worker has been assigned to patient since he was placed in foster care. Visits patient and foster parents biweekly. Patient argues with social worker when she tries to talk to him about school or drug use because he doesn't feel he is doing anything wrong.

Education & activities: Patient has very poor attendance and is barely passing. Skips class frequently to smoke marijuana with friends. Goes to class high when he does attend. Principal has spoken with the patient and foster parents about this multiple times, but the patient's behavior has not changed. Enjoys going out with friends. Does not participate in any formal extracurricular activities. No recent changes.

Alcohol & drugs: Has smoked marijuana daily since he was 13 and consumes methamphetamine regularly. Binges on hard liquor and beer most weekends. Has been to the hospital twice before today after becoming unconscious at parties (six and nine months ago). Social worker and foster parents have tried to get patient to attend substance use counseling but patient refuses. Biological father struggled with substance abuse.

Relationships & bullying: He has a close circle of friends, who he parties and smokes marijuana with. He denies being bullied.

Thoughts & anxiety: Once the patient has sobered up, he denies hallucinations, delusions, or intrusive thoughts. He says he does not care about life in general, other than partying and getting high. He denies any anxiety, other than when high on drugs. If anything, he feels fearless. He's seen a counsellor and has been diagnosed with bipolar disorder but no thought problems.

Safety: He does not have thoughts of taking his own life or the life of others. When confronted about the fact that his behavior may threaten his life, he laughs and says he is not trying to take his own life, but that would be fine; he doesn't think anyone would miss him.

Sexual health: He engages in sexual activity when he is intoxicated, with multiple partners and condoms are not always used.

Mood: He was unhappy to be in emergency department and does not remember his mood yesterday. He says his mood can get low (sad) but he often feels energetic. This past week, he was feeling excited and drinks more when he is feeling good. He was told to see the Child and Youth Mental Health Team after switching to his current foster family. There, he saw a clinical psychologist who diagnosed him with bipolar disorder (mood can change fast) and told him to see a psychiatrist. The patient refused to attend more than four sessions with the psychologist and did not follow up with psychiatrist. The patient can become aggressive (yelling, punching walls, slamming doors) when foster parents attempt to discuss his drug use. He refuses to see professional services.

Abuse: His biological father was physically and verbally abusive. The Ministry of Child and Family Development became involved four years ago; no further abuse has been reported.

Professionals & resources: He was told to see the Child and Youth Mental Health Team last year. He was diagnosed with bipolar disorder by a clinical psychologist there; but he refused to continue going to see them after four sessions. He was told to see a psychiatrist but refuses to see them. The patient has had a social worker for the past four years.

Appendix C: MyHEARTSMAP (paper version)

Home My current situation:	Guiding questions Is there difficulty or fighting at hon Do I have a place to call home?	ne?	Do I have someone at home to speak to when I feel upset? Is my gender identity or sexual orientation a source of stress at home? Do I feel safe at home?			
	is there stress related to money wi		Do rieei sale at nome?			
	0	1	2	3		
1	Everyone usually gets along at	Sometimes there are	There are frequent	There is so much conflict at home		
	home and I can talk about my	arguments/stressors at home, but	arguments/stressors at home.	that it is not healthy for me to be		
	feelings with my	we are able to work through	which make me uncomfortable to	there.		
	parents/guardians when I feel	them. I have someone at home	be there.	OR		
	upset.	that I can talk to when I feel	OB	I do not have a home.		
		upset.	When I talk to people at home			
			about something that upsets me, they don't help me.			
Resources (outside the emergency department)	l have a social worker involved in my home situation.		I do not have a social worker involved in my home situation.			
Education and Activities	Guiding questions					
My current situation:	How is school going for me?		Do I go to school or do I skip a lot o	of classes?		
	Are there any difficulties going to s	chool or staying in class?	An I keeping up with my work and what kind of grades am I getting? Do I participate in the afterschool activities that I agreed to?			
]	What do I do for fun? Has that cha	nged recently?				
]						
1	0	1	2	3		
	I am doing fine in school and my	Despite trying, it is hard to keep	My grades are dropping.	I am failing some of my classes and		
	grades haven't changed. I go to all	my grades up.	OR	might not go into the next grade.		
	my classes and after-school	OR	I miss or skip more classes and	OR		
	activities.	Sometimes I miss school or my	afterschool activities than I	I have stopped going to school or		
		afterschool activities or I have	attend.	I'm dropping out of school. I don't		
		started giving up some of my		go to any of my afterschool		
		afterschool activities.		activities anymore.		
		am homeschooled and it is going				
		weii.				
Resources (outside the emergency department)	My school counsellor/teacher/prin sch	ncipal is involved in my situation at ool.	My school counsellor/teacher/principal is not involved in my situation at school.			
Alcohol and Drugs	Guiding questions					
My current situation:	Do I use alcohol and drugs? How o	ften?	Do I know what drugs and alcohol	can do to my body?		
	Do I use marijuana? How about an Do I use drugs or alcohol to make r	y other drugs? ne feel better or deal with a	Have the alcohol and drugs affected my ability to go to school or participate fully in my day to day life?			
	problem.					
]	0	1	2	3		
	I have never or no longer drink	I sometimes drink alcohol OR	I regularly drink alcohol, or smoke	I drink a lot of alcohol in a short		
	alcohol, and I do not use or no	smoke cigarettes OR use	cigarettes or use marijuana or	time to get drunk.		
	longer use any drugs.	marijuana (e.g. like at parties or	other drugs.	OR		
		special occasions).	OR	I feel stressed/annoyed when I do		
			My drinking or drug use	not drink or use drugs.		
			negatively affects my life (e.g. l			
			have missed school because I was	I am using more drugs to get the		
			nung-over).	same nign.		
Resources (outside the emergency department)	ا have been referred to a progra drug	m to help me with my drinking or g use.	I have not been referred to a program to help me with my drinking or drug use.			
Relationships and Bullying	Guiding questions					
My current situation:	How are things going for me with f	riends and relationships?	Are my friends supportive? Am I al	ple to keep the friends I make?		
1	Do I have a close person/group of	people that I can rely on?	Am I being teased or bullied at school or online?			
	Am I comfortable and supported in	n my gender identity and/or sexual	Are any of my relationships, or lac	k of relationships, making my life		
	orientation?		really hard right now?			
]	0	1	2	3		
	I am happy with my friendships	I have a few friends but it is hard	I am losing friends and/or getting	I do not have any friends or a		
	and/or romantic partnership and	to keep them or talk to them	bullied.	romantic partner and I feel alone.		
	do not get bullied	about my problems or I have a	OR	OR		
		hard time making new friends.	I have a romantic partner and our	I get bullied and it makes me feel so		
		OR	relationship is very stressful.	upset that I do not want to leave my		
		Sometimes I get bullied but it	This makes me feel anxious/sad	home (e.g. to go to school or		
		doesn't really affect me.	and makes it hard to do my school	activities).		
		OR	work.			
		I have a romantic partner but we				
		argue a lot.				
Resources (outside the emergency department)	My school teacher, counsellor and problems with my friends/partner	/or social worker knows about the and/or bullies and they have been	No one is helping me with the p and/o	, problems with my friends/partner r bullies.		
	trying to	help me.				
-	•					

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	+		•				
Thoughts and Anxiety	Guiding questions						
My current situation:	Do I spend a lot of time worrying o	r feeling stressed?	Do I get so stressed that I can't par	ticipate in my day to day life?			
· · · · · · · · · · · · · · · · · · ·	Do lever experience panic / extrem	ne fear that comes without	Do neonle think that my thoughts are strange (e.g. believing that I can				
	evplanation?		read other people's minds)?				
	Do Lover have times where Lbear i	voices that are not there?	read other people's minus):				
	Do rever have times where r hear v	voices that are not there?					
		1	2	2			
		1	2	3			
	I don't have anxiety or thought	Sometimes I feel stressed or	l often feel stressed or anxious,	I feel stressed or anxious most of			
	concerns.	anxious, but I am still able to	and it makes it difficult to get	the time, and it prevents me from			
	OR	continue with my daily routine.	through my daily routine.	leaving my house or going to			
	When I have a lot of things going	OR	OR	school.			
	on, I know what to do to help me	Sometimes have strange	People have told me my thoughts	OR			
	stay calm.	thoughts, that I know don't make	are strange/hard to believe but I	I hear voices that other people do			
		sense.	think my concerns are real.	not hear.			
Resources (outside the emergency	I have seen and been helped/trea	ated by a doctor/counsellor about	I have not seen and been helped/t	reated by a doctor/counsellor about			
department)	my anxiety or thought concerns. my anxiety or thought concerns.						
Cafaty							
Safety	Guiding questions						
My current situation:	In the past few weeks, have I thoug	ght of hurting myself?	Do I sometimes feel hopeless, or th	Do I sometimes feel hopeless, or that life is not worth living?			
	Do I have thoughts of hurting myse	elf or others? Have I ever tried? If I	In the past few weeks, have I felt that it would be better for me or my				
	have these thoughts, do I have a pl	lan of how or when I might do it?	amily if I were dead?				
	In the past few weeks, have I serio	usly considered ending my life?	Have I ever tried to end my life?				
	0	1	2	3			
1	I do not have thoughts of suicide,	Sometimes wish was dead, or	I often wish I was dead, or have	I am seriously considering suicide			
	wishing I were dead, or hurting	have thoughts of suicide, but I	thoughts of suicide, but don't	and I have a plan for how to do it.			
1	myself or others.	don't think I would ever act on	know if I would go through with it	OR			
	,	these thoughts.	or how I would do it.	Lam practicing the steps toward			
		OB	OR	ending my life to see how it would			
		have burt myself on purpose	I have threatened other people	feel (e.g. bolding pills in my band			
		(a g cutting) but I don't see this	but I have never intentionally	feeling rope around my neck)			
		e.g. cutting, but tubin t see this	physically burt apyone in a serious				
		as a way to end my me, rather a	physically nurt anyone in a serious	UN			
		way to cope with my leenings.	way.	actions toward others and wanting			
				actions toward others and wanting			
		I have thoughts of nurting others		to really nurt them.			
		but would not go through with it.					
Resources (outside the emergency	Someone else knows about my th	oughts AND we have a safety plan	Nobody knows about my thought	s and/or I do not have a safety plan.			
department)	(we can recognize signs of when I	'm feeling really down and I am at					
	risk of doing something harmful.	We also have a list of strategies to					
	help me feel better or get me safe	and this has been working for me).					
S exual Health	Guiding questions						
My current situation:	Am I sexually active? Do I have one	or multiple sexual partners?	Do Let any information about sex	ual health from doctors or nurses?			
	Do I know about and use any mode	e of protection?	Have Lever been forced to have se	I ever been forced to have sex (or had sex when I didn't want to)?			
	Do Luse protection against sexually	transmitted diseases?	Have I ever had sex in exchange for money or other goods?				
	bo ruse protection against sexual						
	0	1	2	3			
	Lam not sexually active	am sexually active in a	am sexually active in a	Lam sexually active with one			
	Tant not sexually active.	conconsual relationship (we both	conconsual relationship and have	narther and we normally do not use			
		consensual relationship (we both	consensual relationship and have	partner and we normally do not use			
		agree) and have one partner. we	one partner. Sometimes we don't	protection, or I have multiple			
		consistently use protection (e.g.	use protection (e.g. condoms).	partners.			
		condoms).		OR			
			i teel pressured into sexual	I have had sexual activity that I did			
			activities that I don't want to do.	not consent (agree) to.			
				OR			
				I have engaged in sexual activities in			
				exchange for money, goods, or			
				exchange for money, goods, or protection.			
				exchange for money, goods, or protection.			
Resources (outside the emergency	l have a doctor/nurse who l	see about my sexual health.	l do not have a doctor/nurse v	I have engaged in sexual activities in exchange for money, goods, or protection. /ho I see about my sexual health.			
Resources (outside the emergency department)	have a doctor/nurse who	see about my sexual health.	I do not have a doctor/nurse w	I have engaged in sexual activities in exchange for money, goods, or protection. /ho I see about my sexual health.			
Resources (outside the emergency department) Mood	i have a doctor/nurse who i Guiding questions	see about my sexual health.	l do not have a doctor/nurse w	I have engaged in sexual activities in exchange for money, goods, or protection. /ho I see about my sexual health.			
Resources (outside the emergency department) Mood My current situation:	I have a doctor/nurse who I Guiding questions Have I been having a lot of mood s	see about my sexual health.	l do not have a doctor/nurse w	I have engaged in sexual activities in exchange for money, goods, or protection. who I see about my sexual health.			
Resources (outside the emergency department) Mood My current situation:	I have a doctor/nurse who I Guiding questions Have I been having a lot of mood s How would i rate my mood, with '	see about my sexual health. wings lately?	l do not have a doctor/nurse w ls my sadness affecting my ability t	I have engaged in sexual activities in exchange for money, goods, or protection. /ho I see about my sexual health. o participate in normal activities? a needing to repeat specific actions			
Resources (outside the emergency department) Mood My current situation:	I have a doctor/nurse who I Guiding questions Have I been having a lot of mood s How would I rate my mood, with 'C '10' heing netfectiv bannu?	see about my sexual health. wings lately? 3' being the lowest possible, and	I do not have a doctor/nurse w Is my sadness affecting my ability t Do I have abnormal behaviours (e., multiple times)? Are these behaviour	I have engaged in sexual activities in exchange for money, goods, or protection. /ho I see about my sexual health. o participate in normal activities? g. needing to repeat specific actions mys disruptive to others or to my			
Resources (outside the emergency department) Mood My current situation:	I have a doctor/nurse who I Guiding questions Have I been having a lot of mood s How would I rate my mood, with 'C '10' being perfectly happy?	see about my sexual health. wings lately?)' being the lowest possible, and	I do not have a doctor/nurse w Is my sadness affecting my ability t Do I have abnormal behaviours (e., multiple times)? Are these behavio own ability to function?	I have engaged in sexual activities in exchange for money, goods, or protection. /ho I see about my sexual health. o participate in normal activities? g. needing to repeat specific actions jurs disruptive to others or to my			
Resources (outside the emergency department) Mood My current situation:	I have a doctor/nurse who I Guiding questions Have I been having a lot of mood s How would I rate my mood, with 'C '10' being perfectly happy?	see about my sexual health. wings lately?)' being the lowest possible, and	I do not have a doctor/nurse w Is my sadness affecting my ability t Do I have abnormal behaviours (e., multiple times)? Are these behavio own ability to function?	I have engaged in sexual activities in exchange for money, goods, or protection. /ho I see about my sexual health. o participate in normal activities? g. needing to repeat specific actions surs disruptive to others or to my			
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Resources (outside the emergency department) Mood My current situation:	I have a doctor/nurse who I Guiding questions Have I been having a lot of mood s How would I rate my mood, with 'C '10' being perfectly happy? 0 0	see about my sexual health. wings lately? 3' being the lowest possible, and 1	I do not have a doctor/nurse w Is my sadness affecting my ability t Do I have abnormal behaviours (e, multiple times)? Are these behavio own ability to function?	I have engaged in sexual activities in exchange for money, goods, or protection. /ho I see about my sexual health. o participate in normal activities? g. needing to repeat specific actions nurs disruptive to others or to my 3			
Resources (outside the emergency department) Mood My current situation:	I have a doctor/nurse who I Guiding questions Have I been having a lot of mood s How would I rate my mood, with 'C '10' being perfectly happy? 0 I don't feel depressed or low,	see about my sexual health. wings lately?)' being the lowest possible, and 1 Sometimes I feel sad or low	I do not have a doctor/nurse w Is my sadness affecting my ability t Do I have abnormal behaviours (e, multiple times)? Are these behavio own ability to function? 2 I often feel sad or low, and I act	I have engaged in sexual activities in exchange for money, goods, or protection. /ho I see about my sexual health. o participate in normal activities? g. needing to repeat specific actions purs disruptive to others or to my 3 I feel sad or low most of the time and the offention			
Resources (outside the emergency department) Mood My current situation:	I have a doctor/nurse who I Guiding questions Have I been having a lot of mood s How would I rate my mood, with 'C '10' being perfectly happy? 0 I don't feel depressed or low, except for when bad things	see about my sexual health. wings lately?)' being the lowest possible, and 1 Sometimes I feel sad or low without a reason, but I am	I do not have a doctor/nurse w Is my sadness affecting my ability t Do I have abnormal behaviours (e., multiple times)? Are these behavio own ability to function? 2 I often feel sad or low, and I act differently when I feel this way.	I have engaged in sexual activities in exchange for money, goods, or protection. /ho I see about my sexual health. o participate in normal activities? g. needing to repeat specific actions rurs disruptive to others or to my 3 I feel sad or low most of the time and it is affecting my sleep or eating			
Resources (outside the emergency department) Mood My current situation:	I have a doctor/nurse who I Guiding questions Have I been having a lot of mood s How would I rate my mood, with 'C '10' being perfectly happy? 0 I don't feel depressed or low, except for when bad things happen.	see about my sexual health. wings lately?)' being the lowest possible, and 1 Sometimes I feel sad or low without a reason, but I am generally in a good mood.	I do not have a doctor/nurse w Is my sadness affecting my ability t Do I have abnormal behaviours (e., multiple times)? Are these behavio own ability to function? 2 I often feel sad or low, and I act differently when I feel this way. OR	I have engaged in sexual activities in exchange for money, goods, or protection. /ho I see about my sexual health. o participate in normal activities? g. needing to repeat specific actions iurs disruptive to others or to my 3 I feel sad or low most of the time and it is affecting my sleep or eating habits.			
Resources (outside the emergency department) Mood My current situation:	I have a doctor/nurse who I Guiding questions Have I been having a lot of mood s How would I rate my mood, with 'C '10' being perfectly happy? 0 I don't feel depressed or low, except for when bad things happen.	see about my sexual health. wings lately?)' being the lowest possible, and 1 Sometimes I feel sad or low without a reason, but I am generally in a good mood.	I do not have a doctor/nurse w Is my sadness affecting my ability t Do I have abnormal behaviours (e., multiple times)? Are these behavio own ability to function? 2 I often feel sad or low, and I act differently when I feel this way. OR People around me have noticed a	I have engaged in sexual activities in exchange for money, goods, or protection. /ho I see about my sexual health. o participate in normal activities? g. needing to repeat specific actions urs disruptive to others or to my 3 I feel sad or low most of the time and it is affecting my sleep or eating habits. OR			
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Resources (outside the emergency department) Mood My current situation:	I have a doctor/nurse who I Guiding questions Have I been having a lot of mood s How would I rate my mood, with 'C '10' being perfectly happy? 0 I don't feel depressed or low, except for when bad things happen.	see about my sexual health. wings lately?)' being the lowest possible, and 1 Sometimes I feel sad or low without a reason, but I am generally in a good mood.	I do not have a doctor/nurse w Is my sadness affecting my ability t Do I have abnormal behaviours (e., multiple times)? Are these behavic own ability to function? 2 I often feel sad or low, and I act differently when I feel this way. OR People around me have noticed a change in my personality or activity level.	I have engaged in sexual activities in exchange for money, goods, or protection. /ho I see about my sexual health. o participate in normal activities? g. needing to repeat specific actions purs disruptive to others or to my			
Resources (outside the emergency department) Mood My current situation:	I have a doctor/nurse who I Guiding questions Have I been having a lot of mood s How would I rate my mood, with 'C '10' being perfectly happy? 0 I don't feel depressed or low, except for when bad things happen.	see about my sexual health. wings lately? ¹ being the lowest possible, and 1 Sometimes I feel sad or low without a reason, but I am generally in a good mood.	I do not have a doctor/nurse w Is my sadness affecting my ability t Do I have abnormal behaviours (e., multiple times)? Are these behavic own ability to function? 2 I often feel sad or low, and I act differently when I feel this way. OR People around me have noticed a change in my personality or activity level.	I have engaged in sexual activities in exchange for money, goods, or protection. /ho I see about my sexual health. o participate in normal activities? g. needing to repeat specific actions rurs disruptive to others or to my 3 I feel sad or low most of the time and it is affecting my sleep or eating habits. OR Sometimes, I have extreme mood swings (e.g. go from happy to sad really fast) for no reason.			
Resources (outside the emergency department) Mood My current situation:	I have a doctor/nurse who I Guiding questions Have I been having a lot of mood s How would I rate my mood, with 'C '10' being perfectly happy? 0 I don't feel depressed or low, except for when bad things happen.	see about my sexual health. wings lately?)' being the lowest possible, and 1 Sometimes I feel sad or low without a reason, but I am generally in a good mood.	I do not have a doctor/nurse w Is my sadness affecting my ability t Do I have abnormal behaviours (e., multiple times)? Are these behavio own ability to function? 2 I often feel sad or low, and I act differently when I feel this way. OR People around me have noticed a change in my personality or activity level.	I have engaged in sexual activities in exchange for money, goods, or protection. /ho I see about my sexual health. o participate in normal activities? g, needing to repeat specific actions uurs disruptive to others or to my			
Resources (outside the emergency department) Mood My current situation:	I have a doctor/nurse who I Guiding questions Have I been having a lot of mood s How would I rate my mood, with 'C '10' being perfectly happy? 0 I don't feel depressed or low, except for when bad things happen. I have seen and been helped/treat	see about my sexual health. wings lately? 2' being the lowest possible, and 1 Sometimes I feel sad or low without a reason, but I am generally in a good mood.	I do not have a doctor/nurse w Is my sadness affecting my ability t Do I have abnormal behaviours (e., multiple times)? Are these behavio own ability to function? 2 I often feel sad or low, and I act differently when I feel this way. OR People around me have noticed a change in my personality or activity level. I have not seen and been helped/t	I have engaged in sexual activities in exchange for money, goods, or protection. /ho I see about my sexual health. o participate in normal activities? g. needing to repeat specific actions surs disruptive to others or to my 3 I feel sad or low most of the time and it is affecting my sleep or eating habits. OR Sometimes, I have extreme mood swings (e.g. go from happy to sad really fast) for no reason.			

Abuse	Guiding questions					
My current situation:	Have I ever experienced abuse, eit	her physical, emotional, or sexual?	Has an adult or person of authority ever beaten me up?			
	Do my parents/guardians take care	e of my basic needs?	Have any adults ever said really m	ean/hurtful things to me?		
	Has anyone (e.g. family members,	teachers) ever hurt me by touching	If yes to any of these, has it been shared with someone (a counsellor, police, social worker) and am I being helped?			
	me in a way I didn't like?					
			-	-		
	0	-	2	3		
	I am not being, and never have		I have been physically, verbally,	am being physically, verbally,		
	been threatened or nurt in any		emotionally and/or sexually	and/or sexually threatened or nurt		
	way (physically, verbally,		threatened or nurt by someone	DP Someone		
	emotionally and/or sexually).		before.	My parents/guardian do not take		
				care of my basic needs (e.g. food		
				clothes, shelter).		
			l.	l		
Resources (outside the emergency	My situation has been reported t	o the Ministry of Child and Family	Yos OP No			
department)	Development, a social wo	orker, doctor, or the police	res OK NO			
Professionals & Resources (for	Guiding questions					
Mental Health)						
My current situation:	Are there people or places/organiz	ations I can go to for help?	Do I think I need support from a doctor/counsellor?			
	Who are the people who are work	ing with me on these issues?	Has anyone told me I need support from a doctor/counsellor?			
	Am I satisfied with the current plan	itisfied with the current plan to help me?		Have I been referred to a doctor/counsellor for my mental health?		
			Have I met with them?			
	0		2	2		
	L have a doctor/counsellor who l		L was told to see a	I have mental health concerns, but I		
	see for my long-term mental		doctor/counsellor for my mental	have not been referred to see a		
	health needs.		health concerns, but I have not	doctor/counsellor vet.		
	OR		seen them all yet. I am on the	OR		
	I do not have any mental health		waitlist for at least some	I have been referred to a		
	concerns.		resources.	doctor/counsellor for my needs, but		
				I do not want to go, or I cannot go		
				(e.g. my parents can't or won't take		
				me).		

Appendix D: Optional demographic information telephone call scripts used for phase two interrater youth and parents (chapter 3.0)

Script for youth participants:

- 1. Hello, this is [*research assistant name*] with the MyHEARTSMAP study at the BC Children's Hospital. Am I speaking with [insert youth's name] or [insert parent's name]?
- 2. Thank you for agreeing to take this call today. Before we get started, I would like to confirm that both [insert youth's name] and [insert parent's name] are present on this call?
 - a. If <u>yes (verbal confirmation)</u>, then: Great, let us get started (proceed to #3)
 - b. If <u>no</u>, then: No problem, we can reschedule our call. Could you provide me with another day and time that would work for both yourself and [insert missing party's name].
- 3. As mentioned in the email you received, [insert youth's name] we will be asking you a couple question about yourself. These will include: whether you identify as being part of a visible ethnic minority or an Aboriginal descent person, and whether you identify as having experienced mental health concerns in the past, regardless of whether you received a mental health-related diagnosis.
- 4. You can answer both of these questions with a "yes" or a "no", and you do not need to provide any additional information if you do not want to. If you do not want to answer the question, you do not have to, and you can say "I do not want to answer."
- 5. Do you have any questions before we begin?
- 6. Question one, do you identify as a being a part of a visible ethnic minority?

If there is confusion with the term:

What we are asking here is if you consider yourself to be non-Caucasian or non-White in colour, and of a non-aboriginal background (e.g. First Nations, Metis).

If "<u>no" to #6</u>, then:

Do you identify as an Aboriginal person? Such as a First Nation, Métis, or Inuit?

7. Question two, do you identify as having experienced mental health concerns in the past? You do not have to have been diagnosed by a doctor.

If there is confusion with the term:

Some common examples of mental health concerns in young people may include problems relating their thoughts or mood, as well as severe anxiousness.

8. That is all the questions we had for you today. Do you have any questions for me, about anything we discussed today?

- 9. Thank you again for your participation and support. I would like to assure that your responses here today will be kept completely confidential and your responses will not be associated with you personally in any way.
- 10. End call

Script for parent participants:

- 1. Hello, this is [*research assistant name*] with the MyHEARTSMAP study at the BC Children's Hospital. Am I speaking with [insert parent participant's name]?
- 2. Thank you for agreeing to take this call today. As mentioned in the email you received, today we will be asking you a couple question about yourself. These will include: whether you identify as being part of a visible ethnic minority or an Aboriginal person, whether you identify as having experienced mental health concerns in the past, regardless of whether you received a mental health-related diagnosis, and finally we would like to confirm your age.
- 3. You can answer the first two questions with a "yes" or a "no", and the age question in years.
- 4. You do not need to provide any additional information if you do not want to. If you do not want to answer a question, you do not have to, and you can say "I do not want to answer."
- 5. Question one, do you identify as a being a part of a visible ethnic minority? If there is confusion with the term:

What we are asking here is if you consider yourself to be non-Caucasian or non-White in colour, and of a non-aboriginal background (e.g. First Nations, Metis).

If "<u>no" to #5</u>, then: Do you identify as an Aboriginal person? Such as a First Nation, Métis, or Inuit

6. Question two, do you identify as having experienced mental health concerns in the past? You do not have to have been diagnosed by a doctor.

If there is confusion with the term:

Some common examples of mental health concerns in young people may include problems relating their thoughts or mood, as well as severe anxiousness.

- 7. And our final question, could you please confirm your age (in years) at the time you enrolled in the study, which was [insert date consent forms were completed].
- 8. That is all the questions we had for you today. Do you have any questions for me, about anything we discussed?

- 9. Thank you again for your participation and support. I would like to assure that your responses are completely confidential and will not be associated with you personally in any way.
- 10. End call

Appendix E: Distribution clinician rater's average scores distribution for each HEARTSMAP section, across the 50 vignettes (chapter 2.0)



Distribution of rater's average HEARTSMAP score for each tool section with 95% confidence intervals

Distribution of all rater's (n=16) average likert score (0-3) across all 50 vignettes, for each tool section. A grey band is used to communicate the 95% confidence intervals for average overall sectional scores.





Appendix F: Distribution youth and parent rater's average scores distribution for each MyHEARTSMAP section, across the 25 vignettes (chapter 3.0)



Distribution of rater's average MyHEARTSMAP score for each tool section with 95% confidence intervals.







