

DIGITAL MENTAL HEALTH INTERVENTION UPTAKE AMONG DISTRESSED
NEW ZEALAND HIGH SCHOOL STUDENTS IN A COMPREHENSIVE SURVEY:
IMPLICATIONS FOR DIGITAL HELP PROVISION

BY

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A thesis
submitted to the Victoria University of Wellington
in fulfilment of the requirements for the degree of
Master in Health Research

Victoria University of Wellington
2020

Abstract

Background: High rates of mental distress are reported among adolescents. Emerging evidence suggests that digital mental health interventions, such as computerised psychotherapy, informative websites, and non-clinical helplines, may help. However, it is unclear whether these resources are reaching those who experience distress in real-world settings.

Aim: The aim of this research is to explore adolescent uptake of digital mental health interventions offered via a comprehensive youth health survey, with a particular focus on adolescents experiencing probable mental distress.

Methods: Data were drawn from the Youth19 Rangatahi Smart Survey. At the end of the survey participants were provided the opportunity to opt-in to receive digital health resources. Participants' opt-in and access to these digital health resources, as well as if they accessed the specific mental health resources, was remotely monitored. We compare opt-in and access among participants with and without probable mental distress.

Results: Of those who completed the Youth19 survey ($n = 7721$), a substantial minority of participants opted-in to receive the digital health resources ($n = 1720$). However, of those who opted-in, access was low ($n = 187$). Participants with probable mental distress were more likely than their non-distressed counterparts to opt-in and access the digital health resources, although these differences were small. Importantly, only seven participants went on to access digital mental health interventions.

Discussion: The moderate number of participants to opt-in to receive Youth19 digital health resources suggests that digital resources may be a valuable component of supporting diverse groups of adolescents. The high attrition, however, indicates that adolescents may be experiencing barriers to accessing these interventions. Smart design to increase appeal, addressing barriers that limit access, and providing multiple options for different groups could increase adolescents' engagement with digital mental health interventions.

Acknowledgements

Whether it be world events, or commonplace thesis woes, this year has been filled with challenges which, without the extensive support network around me, would have been more difficult to navigate. To everyone who has contributed to this process and this year, thank you.

First and foremost, I want to thank my supervisors, Dr Terry Fleming and Dr Octavia Calder-Dawe. Your enthusiasm about this project, your encouraging words at moments of need, and your ongoing support (both academic and emotional) have shaped this experience and, likely, my future. You have both taught me so much. This thesis would not have been possible without you. It has been an honour and a privilege to work on this project as part of the Youth19 team, and not one that I take lightly. Without the young people who took part and the whole Youth19 Research Team this project would not have been possible, thank you.

I have the privilege of also being surrounded by many brilliant, wise, and kind friends and colleagues. You are constant sources of inspiration. I am so grateful for your support, whether it came in the form of advice, distraction, encouragement, hugs, coffee, chocolate, or text messages. In particular, thank you to the School of Health postgraduates and staff for the camaraderie, particularly Dr Eva Neely and Dr Victoria Chinn. Thank you, Nicole Jackson, Megan Garbutt, Courtney Durr, Michaela Peattie, and Sophie Muller for being constants in my life. Emma Tennant, Fiona Grattan, Gloria Fraser, and Radhika Patel-Cornish; how do you even describe our wonderful group – there are no words, you are all brilliant. An especially big thanks to Kealagh Robinson, Sophie Hedley and Kate McLeod who huddled around me as I neared the finish line.

My family, particularly the McCartens, I miss you and I love you. Lastly, Mum and Dad, “thank you” has never been, and will never be, enough. Your unwavering support had provided me with a constant source of strength. I appreciate all that you do for me.

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Chapter 1: General Introduction

1.1 Problem Statement

Rates of adolescent mental distress are concerning (Fleming et al., 2014; Fleming, Tiatia-Seath, et al., 2020; Twenge et al., 2019) and access to mental health resources are low and inequitable (Sheppard et al., 2018; Waitangi Tribunal, 2019). Research demonstrates that there are a range of effective and cost-effective interventions to reduce adolescent mental distress, including psychotropic medication, psychotherapy, and educational interventions (Higa-McMillan et al., 2016; Locher et al., 2017; Weersing et al., 2017); however, structural and personal barriers can limit access to some mental health help options which, in turn, may exacerbate mental health inequities (T. Clark et al., 2018; Denny et al., 2013; Gulliver et al., 2010; Radez et al., 2020).

Digital mental health interventions (DMHI) address some of these shortcomings. Emerging literature suggests that digital technology is an acceptable and effective medium to deliver mental health interventions and information to adolescents in randomised controlled trials (Donker et al., 2009; Ebert et al., 2015; Grist et al., 2019). Furthermore, adolescents already use the internet to access mental health information (Hall et al., 2019; Utter et al., 2017) and report, in general, that they are satisfied with using technology to receive mental health support (Fleming et al., 2019; Peiris-John et al., 2020; Pretorius et al., 2019).

For these interventions to be effective, adolescents must engage with them in uncontrolled or naturalistic settings outside of a controlled trial environment, hereafter, a real-world setting (Donkin et al., 2011; Fleming et al., 2018). Unfortunately, there is a lack of data reporting real-world uptake of DMHI, particularly among adolescents, and the evidence that we do have available indicates that there are significant differences between controlled trial uptake and real-world uptake (Christensen et al., 2009; Fleming et al., 2018). Effective distribution of DMHI in real-world settings requires analysis of the users' needs and preferences, appropriate technology and theory underpinning the interventions, and transparent reporting of efficacy, uptake and reach (Fleming et al., 2016).

Currently, it is unclear whether adolescents access DMHI in uncontrolled environments and, if they do, which adolescents access these resources. Specifically, it is unclear if DMHI reach adolescents who are experiencing mental distress which is critical if DMHI are to contribute to improving mental health outcomes and reducing mental health inequities.

1.2 Purpose of the Study

This thesis intends to explore these pressing questions regarding adolescents' naturalistic DMHI uptake, with a particular interest in their potential to support adolescents who are experiencing emotional distress. Drawing on data collected as part of the Youth19 Rangatahi Smart Survey, this research explores whether adolescents who are experiencing emotional distress are more likely to access these resources compared to those who are not experiencing emotional distress.

These findings may contribute to our understanding of which adolescents are interested in and accessing DMHI. This research, in conjunction with other digital health literature, can help us to target DMHI to those who are currently engaging with this medium, and improve offerings to increase reach to other groups.

1.3 Positioning the Researcher: Cautious but hopeful

Inspired by the knowledge gained while studying for my Bachelor of Science in Psychology (Hons) and the experience gained while working as a youth mental health community support worker, I became interested in youth mental health and help-seeking. In particular, I was intrigued by what resources and services were available for young people experiencing distress and how they interact with these options. In my work in a community mental health setting, adolescents appeared to engage with a range of digital devices and applications to communicate with friends, play video games, and learn about their diagnoses and treatment, and appeared to be knowledgeable about the DMHI (information, therapy, helplines) available. It was unclear, however, whether they were engaging with these resources at times when they were experiencing distress. At this point, I also became acutely aware of my own need for mental health support, the resources available to me, and my lack of interest in reaching out for them.

I observed that seeking help was nuanced and subject to individuals' needs, preferences, abilities, previous experiencing of help, and the presence of privileges. The possibility that DMHI could address some of these issues and reach adolescents who required support, on a device that they were familiar with, is promising. I am, however, mindful of the negative role that technology plays in our lives, and the paradox of recommending the increased use of

technology which, itself, may be contributing to poorer mental health outcomes (Burr et al., 2020). Even so, its presence in our lives is, to some extent, undeniable. As such, I approach this thesis considering the potential mental health benefits that could come from harnessing the power of the digital environment, but am intent on remaining aware of its potential limitations and the current gaps in this knowledge, one of which I explore in this thesis.

My choice to study a topic at the intersection of adolescent mental health, digital technologies, and access to help is therefore undoubtedly guided by these experiences and opinions. This current research project is underpinned by a critical realist perspective which allows me to acknowledge that these experiences will have shaped how I chose to design the research questions, conduct the literature review, and analyse and interpret the findings. It also allows me to consider the social systems and context which may affect adolescents, their mental health, and the potential of digital interventions. A more detailed description of this research methodology is provided in *4.1.1 Methodology*.

1.4 Research Questions

The aim of this research is to explore real-world DMHI uptake among adolescents. At the end of the Youth19 Rangatahi Smart Survey (a comprehensive health and wellbeing survey conducted in New Zealand), participants were given the opportunity to opt-in to receive a collection of survey-relevant digital health resources (DHR). DMHI were provided within the DHR. I set out to describe who accessed the DMHI, with a particular focus on whether the DMHI reached those experiencing probable mental distress. To address this aim, I consider the participants' journey through DHR opt-in and DHR access, to DMHI access.

Drawing on survey data from Youth19 Rangatahi Smart Survey, this research set out to address the following four questions:

- 1) How many New Zealand high school students experiencing probable mental distress opt-in to receive and access DHR available through the Youth19 survey?
- 2) How does this compare to New Zealand high school students who are not experiencing probable mental distress?

- 3) Are New Zealand high school students that are experiencing probable mental distress more likely to access DMHI than those who are not experiencing probable mental distress?
- 4) What are the characteristics of distressed New Zealand high school students who access DMHI?

1.5 Outline of Thesis

This thesis includes six chapters. In this introductory chapter, I have outlined the purpose of this research, the research paradigm underpinning this research and the research questions that I will address. Chapter 2 provides a review of the three relevant literatures: adolescents, adolescent mental health, and finally the promise and challenges for using digital mental health interventions to support adolescents who are experiencing probable distress. In Chapter 3, I will provide a rationale for my research. Chapter 4 outlines the key project methods in detail. In Chapter 5, I report on the key results from the research, linking them to my research aim and research questions. In Chapter 6, I situate the findings of the current study within the literature, discuss their research and clinical implications, outline the strengths and limitations of the study, and finally suggest directions for future research.

Chapter 2: Literature Review

This literature review begins by exploring adolescence as a sociocultural category and considers the experiences and changes that typically occur within this developmental period. Drawing on models of health and development and considering the local context in Aotearoa New Zealand helps us to conceptualise adolescence and to familiarise ourselves with the population of interest. From here, our focus narrows to a more specific consideration of mental distress and disorder in adolescents, including an overview of current definitions, as well as relevant models of mental health and global and local epidemiology; then, I will turn to what methods are currently being used to address this problem. Once armed with appropriate background knowledge of adolescents and their mental health, I will narrow in to review the promise of, evidence for, and challenges of emerging digital mental health interventions. These challenges, in conjunction with the established literature, will lead to the rationale for the current research.

2.1 Adolescents

2.1.1 Conceptualising Adolescence

Adolescence is the transitional period between childhood and adulthood and is characterised by rapid social, biological and emotional development (S. Sawyer et al., 2018), but is not defined by any age or specific event (Spear, 2000). Conceptualisations of adolescence are subject to influence from social roles, cultural values, time, laws, and economic conditions resulting in its lower and upper boundaries being disputed (Choudhury, 2010; S. Sawyer et al., 2018; Spear, 2000). Therefore, rather than a fixed, specific period of time, adolescence is a socially constructed category which is influenced by a myriad of contextual factors (for discussion see Choudhury, 2010; Zarrett & Eccles, 2006), elongating to account for the divergence of sexual and social development (Kleinert, 2007). Language used to describe these categories is also ambiguous due to terms such as youth and adolescence being used interchangeably. Nonetheless, this period is of great research, policy, medical and community interest due to the numerous developmental changes, opportunities and risks that occur during adolescence (Andersen, 2003; Kleinert, 2007; S. Sawyer et al., 2012).

For the purposes of this thesis, adolescence refers to the period between childhood and adulthood, and adolescents as those within this period, aged 10 - 19 (World Health Organisation, n.d.).

Theory. Measuring the experiences and behaviours of adolescents enables theorists to model how these variables interact, how they contribute to adolescent health, and the longer-term effects of poor adolescent health across the life course. Three multi-level models of health are drawn upon in this thesis to conceptualise adolescent health and development. This provides a framework for understanding the complexity of the adolescent experience, allows us to consider a wide range of different systems that may impact adolescent lives, and consequently, provides a foundation to discuss the manifestation of mental disorder and distress in the following section.

Biopsychosocial Model. Engel (1977) originally proposed this model to show the contribution that biological, psychological, and socio-environmental domains have on the development of psychiatric disorders. This model does not call for an in-depth analysis of the biological mechanisms and interactions that occur within and between these three domains, but can be used as a holistic framework to explore the numerous variables that may contribute to an individuals' or a groups' health or development, and acknowledge the interplay between them (Borrell-Carrio, 2004; Tripathi et al., 2019). Drawing upon this model allows us to familiarise ourselves with what adolescents are experiencing as a group and outline some key factors that contribute to their health and development.

Genetic variations can not only contribute to increasing susceptibility to specific mental health conditions (Clément et al., 2002; Kato et al., 2005) but can also influence the onset of puberty (Zhu et al., 2018). Puberty, in turn, is associated with many of its own changes, including hormonal (surges in sex and stress hormone levels, metabolic rate, sexual maturation), physical (acne, height, and secondary sex characteristics) and neurological (structural and functional change in brain) (Blakemore et al., 2010; Dorn, 2006; Sisk & Foster, 2004; Vijayakumar et al., 2018). Genetic, hormonal and neurological changes are thought to all contribute to the increased onset of mental disorder during adolescence; however, exact biological mechanisms that connect these complex systems and their specific effect on mental health still largely remains unclear (Eiland & Romeo, 2013; Hankin et al., 2015; Vijayakumar et al., 2018).

Nested beside the biological domain, the psychological domain poses that cognition, behaviour and emotions can also impact health outcomes (Engel, 1977). For example, adolescents are presented with various personal challenges, including an increase in perceived number and intensity of stressors (Jose & Ratcliffe, 2004). According to Beck's cognitive theory (Abramson et al., 1989), known as the negative triad, people experiencing negative thoughts about oneself will also have negative thoughts about the world, and the future. For example, a person who is dealing with a significant life stressor might believe: "I can't cope", "the world is too stressful" and "I will always feel this way." These beliefs then shape the way they interact with the world, and may fuel reliance on maladaptive coping strategies, such as poor sleep, substance use, poor nutrition, that can further effect health or mental health outcomes (Shortt & Spence, 2006)

Alongside biological and psychological changes, adolescents also experience social changes (Zarrett & Eccles, 2006). The expectation to reduce reliance on parents and increase independence, for example, shapes the size and quality of individual's support system (Collins, 1990). While navigating these changes in familial, platonic and sexual relationships (Furman & Collins, 2009), adolescents must contend with increased peer pressure (Santor et al., 2000), high expectations and school-based achievement pressures (Suldo et al., 2008), and concerns about their future (Fleming, Ball, et al., 2020). Many adolescents are also greatly concerned with matters of social justice, and consider the eradication of discrimination as an important aspect living a healthier, happier life; this is unsurprising given the damaging effects that racism and discrimination can have upon adolescents' social and health outcomes (Fleming, Ball, et al., 2020; Harris et al., 2012). Interestingly, however, these experiences are not universal, experienced mostly by those in Western societies, demonstrating that the adolescent experience does depend upon the social, economic, cultural and historical context (Choudhury, 2010).

These three domains, while presented independently, are interconnected; for example, the changes within the brain affect individual behaviours and social connections, which reciprocally, affect brain development (e.g. Allan et al., 2016; Lamblin et al., 2017). Briefly considering the numerous variables contained within these biological, psychological, and social domains and the interplay between them demonstrates the holistic and multi-faceted nature of adolescent lives, development and, as explored in the section below, mental health.

Life Course Perspective. The second model of health drawn upon in this thesis, the life course perspective, also takes a holistic perspective by considering how events and social context across time may impact individual and group health outcomes, specifically recognising the effect of “historical and geographical location, social ties to others, personal control, and variations in timing” (Elder, 1994; Giele & Elder, 1998, p. 4). Across the life course, risk factors (i.e. variables that increase the risk of a given disorder) appear to accumulate at specific life stages, which may then alter future health trajectories. For example, early life risk factors may adversely impact health outcomes during adolescence (Wickrama et al., 2005) and, equally, the clustering of risk factors that occurs during adolescence may adversely affect health outcomes during adulthood (Gore et al., 2011; Mathers & Loncar, 2006; Patel et al., 2007). Such risk factors also appear to cluster or create a chain-reaction, usually due to socioeconomic position, resulting in individuals who have any one risk factor being more likely to develop or experience another (Dodge et al., 2008).

Drawing on the biopsychosocial model (Engel, 1977) and life course perspective (Elder, 1994; Giele & Elder, 1998) enables individual adolescent health to be considered from a personal perspective (what is happening for the individual), population perspective (what is happening for this group) and as a stage of life (impacted by the past and present, and impacting the future). Adolescence, as such, is considered a window of opportunity to provide adequate prevention and treatment interventions to improve current health and health trajectories (Gore et al., 2011; Jessor, 2014; Patton et al., 2010; S. Sawyer et al., 2012).

Bronfenbrenner Ecological Systems Model. Personal and social context is also considered within Bronfenbrenner’s ecological systems model (1979) which theorises that different communities, depicted by systems, have both direct and indirect effects on adolescent health and development. The individual and their personal identity and circumstances (e.g. age, sex, health) is depicted as being in the middle of this model; the individual is nested within their microsystem (their immediate relationships and connections), which is nested within their exosystem (their wider community and local environment), which is nested within their macrosystem (the cultural, political, historical, social and environmental conditions), which are all influenced by the chronosystem (the effect of time on the individual, social attitudes, and historical events).

Originally Bronfenbrenner's ecological systems model (1979) was developed to conceptualise the different systems and communities that influence human development. However, it has since been adapted (Bronfenbrenner, 1986; Bronfenbrenner & Ceci, 1994; Bronfenbrenner & Evans, 2000) and used more broadly, one of the newer applications being its ability to inform the delivery of public mental health interventions (Eriksson et al., 2018; Tudge et al., 2009). This provides a framework to contemplate the interaction within and between ecological systems (and the individual) in the development of poor mental health outcomes, and in the development of effective interventions.

Despite their differing theoretical and epistemological commitments, these theories and models together demonstrate that: adolescent development is influenced by complex interactions between various contexts and events; that early experiences contribute to their health and wellbeing outcomes in adolescence; and, that adolescence is a highly influential developmental period for future health and wellbeing. As such, the individual and relevant contextual factors should be considered when discussing the health or mental health of adolescents and any mental health interventions proposed for them, as discussed in the following sections of this literature review.

2.1.2 Adolescence in Aotearoa New Zealand

As discussed in relation to the biopsychosocial model (Engel, 1977) and ecological systems model (Bronfenbrenner, 1979), adolescent health and development is affected by socioeconomic, political and cultural context. Briefly commenting on New Zealand context enables us to consider what adolescence looks like in New Zealand and what factors may be shaping the health of adolescents locally.

According to the 2013 New Zealand census, 10- to 17-year-olds accounted for approximately 13% of the total population and under those 18-year-olds accounted for approximately 24% of the total population. Within the 10-17 age band, 59.10% were European, 19.79% were Māori, 10.30% were Asian, 9.74% were Pacific peoples, and 1.07% were other ethnicities (Office of the Children's Commissioner, 2018), making New Zealand a young and multicultural society.

Māori are the indigenous people of New Zealand and were the dominant ethnicity inhabiting New Zealand prior to the arrival of European settlers in the late 1700s. The signing of

te Tiriti o Waitangi (the Treaty of Waitangi) in 1840 and the subsequent influx of British settlers had a large impact upon educational, social, health, and religious norms within New Zealand, and continues to shape the cultural context of New Zealand and the health and wellbeing of its peoples (Moewaka Barnes & McCreanor, 2019; Reid et al., 2019). One example being the increased racism experienced by Māori adolescents and adolescents of other minority ethnicities, and the negative effect this discrimination has on general health and mental health outcomes (Crengle et al., 2012; A. Williams et al., 2018). Strong cultural connectedness and identity among Māori adolescents, however, is associated with improved wellbeing and fewer symptoms of depression (A. Williams et al., 2018).

Socioeconomic and health inequities are also associated with poorer health outcomes which is of concern given that approximately 20% of adolescents in New Zealand live in households experiencing moderate to high levels of poverty (Denny et al., 2016). Socioeconomic and mental health inequities do persist between New Zealand European and Māori adolescents, despite the significant improvements in health outcomes seen among Māori adolescents between 2001 and 2012 (T. Clark et al., 2013, 2018; Crengle et al., 2012). Inequities in access to healthcare and health outcomes are also reported among adolescents with disabilities (Peiris-John et al., 2016), adolescent migrant groups (Lewycka et al., 2020), and sexual- or gender-minority adolescents (Chiang et al., 2017; T. Clark et al., 2014; Lucassen et al., 2011) in New Zealand.

In addition to adolescents' varied experiences of health, adolescents also have to navigate numerous legal and social role changes during this period; for example, the transition from being legally dependent on their caregiver to legally independent between age 12 and 18. As discussed in relation to the biopsychosocial model (Engel, 1977) and the life course perspective (Elder, 1994; Giele & Elder, 1998), numerous changes in legal rights clustered during adolescence, such as, the rights to drive, have consensual sex, get married, and buy alcohol, can also impact upon health and wellbeing outcomes (for discussion see Zarrett & Eccles, 2006). Most students (82%) do stay in enrolled at school until their 17th birthday, of those about half (58%) attend school regularly (Education Counts, 2020).

The mental health of adolescents, as a key focus of this thesis, will receive further attention in the following section.

2.1.3 Conclusion

Reviewing the biopsychosocial model, ecological systems model and the life course perspective draws attention to the plethora of experiences, communities, and systems that can influence adolescent health. Established literature also documents the significant effects of adolescence on the future health outcomes and trajectories (Gore et al., 2011; Mathers & Loncar, 2006; Patel et al., 2007). Considering the experiences and health of adolescents in New Zealand adds relevant context to these models providing the theoretical and applied knowledge of New Zealand adolescents required to conduct adolescent mental health research (Aneshensel & Sucoff, 1996).

2.2 Adolescent Mental Distress

Having defined adolescence, demonstrated the importance of this developmental period on long-term health outcomes, and described the New Zealand cultural and social context, I turn to the mental health of this group. To provide clarity, I will define mental disorder, mental distress, and mental health, and introduce the key term “probable mental distress”, then will provide an overview of adolescent mental health internationally and within New Zealand. There are an array of current approaches used to improve adolescent mental health within New Zealand; I introduce and provide evidence for four of these approaches and identify some of the barriers that adolescents may experience when trying to access or use them, before looking to promising, new approaches in the following section.

2.2.1 Conceptualising Adolescent Mental Distress

Defining and understanding mental disorder, distress, and health has been a longstanding interest of science, medicine, philosophy and the arts. Definitions inform appropriate treatment and care, policy decisions, research focus and funding opportunities but consistent, universal definitions have remained elusive. Like the definition of adolescence, mental disorder, distress and health are socially constructed categories and thus, as explained below, are influenced by the current social, cultural, medical, and historical context (for discussion see Choudhury, 2010).

Mental Disorder. Extensive research into the aetiology, symptomatology, and treatment of mental disorders has resulted in the development of sophisticated classification systems and diagnostic tools. The Diagnostic Statistical Manual of Mental Disorders (American Psychiatric

Association, 2013) and the International Classification of Diseases (World Health Organisation, 1992) are used by licensed psychologists and psychiatrists to diagnose mental disorder based on the presence of specific combinations of psychiatric, emotional and physical symptoms.

Alongside the differences in classification systems, various sociocultural and personal factors affect how mental disorder is perceived and defined (Bolton, 2010; Canino & Alegría, 2008). As such, there is not a universal definition for mental disorder. However, based on contemporary western models and for the purpose of this thesis, *mental disorder* is defined as the presence of ongoing emotional or psychological problems which cause risk, harm or distress, are outside normal age expectations and have been assessed and diagnosed by licensed psychologists or psychiatrists (American Psychiatric Association, 2013).

Mental Distress. Distinguishing between mental disorder and mental distress can be challenging. Clinical models used to diagnose mental disorders consider the type, severity, duration and impact of symptoms; however, many adolescents experience symptoms of mental distress which may be ‘subclinical’ or may not meet the cut off for a full threshold mental disorder (Patel et al., 2018). Hereafter, the term *mental distress* will be used as an umbrella term to include those who may have mental disorder, and those who may not meet clinical criteria but are experiencing current mental health challenges. This includes people who experience some clinically significant symptoms of depression or anxiety, such as irritability, reduced interest in activities and depressed mood, but may not satisfy the criteria to receive a diagnosis of mental disorder (American Psychiatric Association, 2013). The literature may also refer to mental distress as psychological or emotional distress.

Standardised questionnaires can be used to measure self-reported symptoms and experiences (e.g. Milfont et al., 2008) but without a clinical assessment people who complete the questionnaire cannot be diagnosed with a mental disorder or guaranteed to be experiencing mental distress. They may, for example, be experiencing symptomology not captured by the measure, could be completing the measure inaccurately, or may not like to be labelled mentally distressed. The term *probable mental distress* is used here to account for this uncertainty.

Mental Health. The relationship between mental health, distress and disorder is complex and remains unclear in theory and clinical practice. The bifactor model considers mental health as an overarching concept that encompasses mental wellbeing and mental distress subcomponents (Hides et al., 2020; Reise, 2012). More evidence is required to support this

model; however, for the purpose of this thesis, the term *mental health* will be based on the bifactor model, such that mental health is an umbrella term of which mental distress and mental wellbeing are subcomponents (Hides et al., 2020).

With these three definitions in mind, the current thesis is particularly interested in participants experiencing probable mental distress. Being an umbrella term, *mental distress* captures a larger group of adolescents who may experience challenges due to their symptoms of mental distress, whether these are sub-clinical or reach full diagnostic criteria. Also, the methods of the current study (e.g. drawing on Youth19 data, large sample size, anonymous, use of standardised self-report questionnaires) means it is not feasible to clinically assess participants to confirm their levels of distress or disorder, therefore, their mental distress is probable. As such, *probable mental disorder* is the appropriate term to use in this thesis to describe participants who indicate that they are experiencing symptoms of mental distress and/or disorder.

Epidemiology. Most mental disorders are thought to develop during adolescence (Gore et al., 2011; Patton et al., 2014). Approximately three-quarters of mental disorders are evident by 24 years old (Kessler et al., 2005) and, among those who do develop common mental disorders as young adults, most experienced mental distress during adolescence (Copeland et al., 2009; Moffitt et al., 2007).

International Adolescent Mental Health. Predicting international prevalence of mental disorder, distress and health is difficult due to relative lack of data regarding adolescent mental health in low- and medium-income countries (LMIC), limitations in the between-country comparison of data, and as discussed previously, lack of consistent definitions across different social and cultural contexts (Canino & Alegría, 2008; Kieling et al., 2011). However, based on current estimates, approximately 10-20% of children and adolescents experience mental disorders (Polanczyk et al., 2015).

The most recent and comprehensive surveys have emerged from the United States of America and consistently report substantial increases in symptoms of depression among adolescents in recent years (Keyes et al., 2019; Mojtabai et al., 2016; Twenge et al., 2019). Between 2005 and 2017, for example, Twenge et al. (2019) found a 52% increase in reports of adolescents experiencing a major depressive episode in the previous 12 months, 8.7% to 13.2%, respectively. Similarly, Keyes et al., (2019) report large increases in adolescents' symptoms of depression between 2012 and 2018. Increases in depressive symptoms and internalising

symptoms, such as anxiety and depression, appear to be particularly pronounced among females (Bor et al., 2014; Keyes et al., 2019).

Adolescent Mental Health in New Zealand. Rates of self-reported mental health concerns have also increased among adolescents in New Zealand in recent years. Between 2007 and 2012, Fleming et al. (2014) report increases in clinically significant symptoms of depression and anxiety, low mood, emotional symptoms, and non-suicidal self-harm among adolescents in New Zealand, but no significant changes in reports of suicidal ideation or attempts. In 2012, 31% of adolescents reported experiencing 2 weeks of low mood, 12.8% reported experiencing depressive symptoms, 15.7% reported suicidal ideation and 4.5% reported attempted suicide (Fleming et al., 2014). The Youth19 Emotional Distress Report shows this has since increased to 22.7% of adolescents experiencing depressive symptoms, 20.7% reported suicidal ideation, and 6.2% reported attempted suicide (Fleming, Tiatia-Seath, et al., 2020).

A growing body of evidence indicates that New Zealand adolescents from specific groups experience mental health disparities. Female adolescents and adolescents who are part of a sexual or gender minority group are at an increased risk of experiencing mental distress in comparison to their male, cisgender, or opposite-sex attracted counterparts (T. Clark et al., 2014; Lucassen et al., 2014). As previously discussed, differences between European and Māori adolescent mental health are narrowing, but significant inequities do remain (T. Clark et al., 2018). Minority stress theory posits that these disparities are not an inherent risk of being part of a minority group but can be attributed, in part, to experiences of stigma and discrimination (Crengle et al., 2012; Meyer, 2003). The intergenerational consequences of colonisation on the individual and on producing an equitable health system are also a significant contributing factor (Moewaka Barnes & McCreanor, 2019).

These consistent, and substantial reports of worsening adolescent mental health are concerning. However, methodological limitations may be partly responsible for observed changes in adolescent mental distress trends; for example, the use of wider diagnostic criteria, increased attention to mental health in academia and media, increased recognition and diagnosis, increased antidepressant prescription, and the use of retrospective recall to compare depression between birth cohorts (Collishaw et al., 2004; Costello et al., 2006).

Theory. The objective of any given mental health theory will depend upon the epistemological or ontological perspective that underpins it and the discipline that it emerges from. They may, for example, seek to explain the aetiology of disorder and the specific mechanisms that contribute to the onset of symptoms (Cuthbert & Kozak, 2013), or may seek to understand what mental health or disorder is from a philosophical perspective (Kendler et al., 2011). The theories most applicable to the current thesis are those that consider how multiple variables from different systems, as discussed in the previous section, may contribute to the onset of symptoms. In turn, this provides a good foundation to contemplate how interventions may affect the onset or reduction of distressing symptoms.

Early biomedical models of mental disorder focused on identifying a root cause of disorder and aimed to alter biological processes to reduce symptoms (Deacon, 2013). In contrast, the diathesis-stress model draws on multi-level models of health – such as biopsychosocial model (Engel, 1977) and life course perspective (Elder, 1994; Giele & Elder, 1998, p. 4) previously discussed – to consider the plethora of variables involved in the development of mental distress and disorder (Hilsman & Garber, 1995; Windle, 2010). Symptoms of distress or disorder are thought to manifest when the diathesis, *predisposition or vulnerability to disorder*, combines with stressors to surpass a threshold (Gazelle & Ladd, 2003; Mann et al., 1999; Sela et al., 2020). If these symptoms and experiences align with the DSM (American Psychiatric Association, 2013) or ICD (World Health Organisation, 1992) categorisation systems, the individual may be formally diagnosed with a mental disorder. Prominent stressors for adolescents in New Zealand, as previously discussed, include stress at home, peer pressure, racism and discrimination, school, finances, pressures associated with the transition to adulthood (Fleming, Ball, et al., 2020; Sotardi & Watson, 2019); research suggests that predisposition or vulnerability may be biological (e.g. genetic, neurological) or psychological (e.g. cognitive, behavioural) in nature (Monroe & Simons, 1991; Nielsen et al., 2020).

The diathesis-stress model has received criticism due to it lacking specificity, for example, that anything could be considered a predisposing factor or stressor (Monroe & Simons, 1991). Despite this, the diathesis-stress model is appropriate to draw upon in this thesis for four reasons. First, and in line with the multi-level models previously discussed, the diathesis model acknowledges the complex interplay of numerous variables and systems that contribute to the development of mental distress and mental disorder (Hilsman & Garber, 1995; Windle, 2010).

Second, this model acknowledges that adolescence is a critical period of development that may see increases in vulnerability and stressors (Andersen, 2003; Calvete et al., 2013; Jose & Ratcliffe, 2004). Third, it provides a conceptual framework for understanding the distinction between experiencing no symptoms of mental distress, symptoms of mental distress, and symptoms of a full-threshold disorder. Last, this model provides a framework to describe how different types of interventions may play a part in improving mental health outcomes, for example, by reducing predisposition, or by reducing stressors. Drawing on Bronfenbrenner's ecological systems model (Bronfenbrenner, 1979; Eriksson et al., 2018), such interventions could occur on the macrosystem (e.g. addressing poverty or climate change), microsystem (e.g. health promotion in communities or schools) or individual level (e.g. personal interventions, psychotherapy).

2.2.2 Improving Adolescent Mental Health

International and local mental health data clearly indicates that improving adolescent mental health is a priority and that, based on the diathesis stress model, there are many approaches that can be used to address this problem (Braet et al., 2012). Mental health intersects with numerous social issues, including crime and imprisonment, education, employment, discrimination, poverty, and homelessness (Ersine et al., 2015; Funk et al., 2012; S. Sawyer et al., 2012), and thus, the motivation to improve adolescent mental health is great. Focusing in to the individual level, improving adolescent mental health improves current quality of life and improves mental health trajectories across the life-course (McGorry, Purcell, Hickie, & Jorm, 2007; M. Sawyer et al., 2002; P. Williams et al., 2002).

Approaches to improve adolescent mental health and achieve these goals are complex. The variables that contribute to mental health are diverse and occur on multiple levels therefore it is unsurprising that so, too, do the potential solutions. The staging model, or staged care approach, considers that each person may have different predispositions and different stressors, be in a difference stage of adolescence, be experiencing different combinations of symptoms and may have different help preferences (Cross et al., 2014). As such, the staging model proposes an array of appropriate interventions and treatments should be available to cater to people of various levels of health, distress or disorder regardless of clinical categories or diagnoses (Fava & Kellner, 1993; Hickie et al., 2013; McGorry, Purcell, Hickie, Yung, et al., 2007; Patel et al.,

2018). Implementing a staging model could be especially valuable in adolescent mental healthcare given the short and long-health benefits that can be achieved with effective intervention during this window (McGorry, Purcell, Hickie, Yung, et al., 2007; Patel et al., 2018).

Current Approaches: Evidence. It is highly unlikely, based on the staging model, that one single intervention or approach will improve adolescent mental health on an individual and population level. The most appropriate mental health intervention for an individual may depend upon the presence and severity of symptoms, access to help options or resources, personal choice and professional opinion (Ellis et al., 2004; Malhi et al., 2015). As such, offering a selection of approaches that are delivered in different ways may be an effective and appropriate method of supporting the mental health of a diverse range of adolescents (Fleming et al., 2019; Patel et al., 2018).

Medication. Consistent with international data (Bachmann et al., 2016), the rate at which young people (aged 0 to 17) in New Zealand were being prescribed antidepressant medication increased by 78% between 2008 and 2016 (Barczyk et al., 2020) despite the inconclusive evidence for their efficacy (Cipriani et al., 2016). Antidepressants are superior to placebo in the treatment of common mental disorders among adolescents in some cases; however, there is only a small difference between medication and placebo benefits, efficacy varies significantly between disorders, and medication has been associated with adverse events and negative side effects (Cipriani et al., 2016; Locher et al., 2017). Additionally, personal or cultural factors may result in medication not being an accessible, appropriate or feasible cause of action (Alegría et al., 2008; Sparks, 2002; Wills et al., 2020).

Psychotherapy. A common alternative or adjunct to medication, psychotherapy aims to improve mental health and decrease symptoms of mental disorder by addressing thoughts, emotions, behaviours or beliefs under the guidance of a licensed professional (Weersing et al., 2017). There are a number of different psychotherapies practised today, of these, cognitive-behavioural therapy (CBT) is the most evidence-based and widely practiced (Hofmann et al., 2012). Research suggests that CBT has positive effects among adolescents with common mental disorders (Marchette & Weisz, 2017; Weersing et al., 2017) but is significantly less effective in adolescents than in adult populations (Cuijpers et al., 2020). Based on the available literature, it is currently unclear whether antidepressant medication, psychotherapy, or a

combination of both is the most effective treatment for adolescent common mental disorders (Cox et al., 2012).

In line with staged care principles, psychotherapy can be an effective mental health support option whether or not the user has a mental disorder (NICE, 2015). However, given the low numbers of licenced health professionals, high demand for their services and the resulting long waitlists, access to this treatment option remains limited and inequitable (K. Allan, 2018). Psychotherapy is traditionally delivered in-person but is now being offered digitally using video-conferencing software which, as discussed in the following section, may help to improve access to these services (Olff, 2015; Taylor et al., 2020).

Psychoeducation. Psychoeducational resources provide evidence-based information on the symptoms, prevention, diagnosis, prognosis or management of mental disorders and mental health. Psychoeducation may be provided to increase the knowledge of the individual themselves, or their family, friends, whānau or carers, and can be delivered in individual, group and community and online settings (Bevan-Jones et al., 2018; Colom, 2011; Tursi et al., 2013). Psychoeducation may be provided in physical or digital form and may be passive (information or feedback) or active (interactive, supervised or forum-based) (Bevan-Jones et al., 2018; Donker et al., 2009).

Psychoeducation is a simple mental health intervention that may improve knowledge of depression, symptom identification, treatment adherence, and outcomes for depression, anxiety and aggression (Bevan-Jones et al., 2018; Donker et al., 2009; Tursi et al., 2013). Psychoeducation is often used in conjunction with other interventions, such as psychotherapy and medication, due to being relatively low-cost compared to other approaches, and easy to deliver (Colom, 2011; Donker et al., 2009). However, there is a lack of evidence available, particularly for the efficacy of *passive* psychoeducational material and its benefits among adolescents (Donker et al., 2009; Merry, Hetrick, et al., 2012).

Mental Health Promotion. Alongside the medication, psychotherapy, and psychoeducational interventions that target the individual, health promotion approaches aim to improve health by also intervening at the community or population level (World Health Organisation, 1986). Health promotion seeks to educate, support, and facilitate communities to improve health outcomes, with mental health promotion seeking to reduce mental health stigma,

educate and support mental health in different settings (Jané-Llopis et al., 2005; World Health Organisation, 1986).

Health promotion have been effectively implemented to improve mental health among adolescents; however, the long-term impact of mental health promotion is unknown and the evidence remains inconclusive (Jané-Llopis & Barry, 2005; O'Reilly et al., 2018). Mental health promotion may also be adapted for use on smartphone applications (apps), informative websites, or social media. Delivering health promotion interventions digitally may help to engage adolescents but more research is required to determine the efficacy and reach of this approach (Hayes et al., 2016).

Current Approaches: Barriers. Despite the range of effective and promising approaches available to improve mental health outcomes, various individual, social, and structural barriers may limit some adolescents' access to them (Radez et al., 2020). This, disappointingly, results in adolescents' mental health needs remaining unmet (Gulliver et al., 2010; Harte et al., 2018; Sheppard et al., 2018). Reviewing adolescents' barriers to mental healthcare is useful to inform how current and future services and resources should adapt to mitigate them.

Individual barriers. Adolescents report various personal reasons for not seeking or accessing mental health help, including poor knowledge of mental health and where to access mental health help, uncertainty about how effective the help would be, negative beliefs about help-seeking and self-stigma, desire for autonomy and to self-manage symptoms, and a preference for informal help options (Radez et al., 2020; Rickwood et al., 2007; Wilson et al., 2011). Adolescents may also not accurately identify that their issue is mental health-related or acknowledge that it is serious enough to warrant help (Radez et al., 2020). Paradoxically, symptoms of anxiety and depression can also act as a barrier to adolescents to receive mental health help; this help-negation effect, *those with increased distress having less intent to seek help*, has been reported among adolescents with clinical mental disorder and sub-clinical mental distress (D. Clark & Fawcett, 1992; Wilson et al., 2007). Concerningly, receiving informal help from family and friends may also be subject to the help-negation effect (Wilson & Deane, 2010) leading researchers to consider other options that may involve fewer barriers, such as digital self-help alternatives (Olesen et al., 2010; Rickwood et al., 2015; Stunden et al., 2020).

Social barriers. Relational factors and social context can not only impact upon health, as discussed in relation to the biopsychosocial model (Engel, 1977), but can also create barriers to accessing mental healthcare. Being female and having a close relationship with a teacher is associated with increased professional help-seeking among New Zealand adolescents; but interestingly, ethnicity and school decile did not affect help-seeking behaviour (Mariu et al., 2012). Perceived mental health stigma from adolescents' social contacts is a barrier to receiving mental health help and, conversely, lack of stigma is a facilitator for help-seeking (Gulliver et al., 2010; Radez et al., 2020).

Structural barriers. Alongside individual and social barriers, larger structural systems such as the cost, accessibility and structure of the healthcare system can create barriers to mental healthcare (Barker et al., 2005). Children and adolescents have cited a plethora of structural barriers to accessing mental healthcare, including lack of time, money, help options, and transport options, long waiting lists, inconvenient opening hours, and staff attitudes (Radez et al., 2020; Robards et al., 2019). Acknowledging adolescents' current barriers to mental health services is required to ensure that existing services and new approaches are developed to provide effective, accessible and equitable mental healthcare options (Patton et al., 2016; Robards et al., 2019).

2.2.3 Conclusion

Levels of adolescent mental distress appear to be increasing in New Zealand and internationally (Fleming et al., 2014; Polanczyk et al., 2015; Twenge et al., 2019). Despite a variety of evidence-based and promising strategies being currently used, adolescent mental health does not appear to be improving (Bor et al., 2014; Fleming et al., 2014). In line with the staged care approach, considering new and innovative ways to offer mental health resources may assist in minimising some of the barriers adolescents experience when accessing mental health help (Gulliver et al., 2010; Radez et al., 2020; Robards et al., 2019). In the following section I will introduce digital mental health interventions as one such approach, review its evidence and consider its challenges.

2.3 Digital Mental Health Interventions

According to Hollis et al. (2017), digital health interventions (DHI) are:

“Interventions that provide information, support and therapy (emotional, decisional, behavioural and neurocognitive) for physical and/or mental health problems via a technological or digital platform (e.g. website, computer, mobile phone application (app), SMS, email, videoconferencing, wearable device)” (p. 475).

This thesis explores adolescent uptake of DHI that are designed to improve mental health outcomes, hereafter, digital mental health interventions (DMHI). More detailed still, I am specifically interested in DMHI that are available at no cost and can be accessed autonomously.

The ability for DMHI to be distributed at large scale (scalable), use a staged-care approach, provide anonymous support, and reduce barriers to healthcare makes it a promising approach to delivering mental healthcare (Christensen & Hickie, 2010; Donker et al., 2013; Fleming et al., 2016; Olff, 2015). In this section, I also review DMHI that provide information, computerised psychotherapy, personal and non-clinical support, and those that use a combined approach. However, there are some challenges that come with DMHI, including their poor uptake in real-world settings (Fleming et al., 2018), which I outline below to provide background and context for the current research.

2.3.1 The Case for DMHI for Adolescents

Scaleable. High unmet mental health needs among adolescents are a growing concern (Harte et al., 2018; Sheppard et al., 2018). This is compounded by reports of worsening adolescent mental health (T. Clark et al., 2013; Fleming, Tiatia-Seath, et al., 2020; Twenge et al., 2019) and reports of overwhelmed clinical mental health services (K. Allan, 2018). Concerningly, over 9% of a large sample of Australian adolescents were reported to have wholly unmet mental health needs while experiencing high levels of psychological distress (Sheppard et al., 2018).

To address this high and unmet demand, in-person mental health support requires a large budget and clinical workforce, whereas DMHI can be scaled up at a lower cost due to their reduced reliance on clinically trained health professionals and the ability to widely distribute resources (Christensen & Hickie, 2010; Fleming et al., 2016; Kazdin, 2017). Large-scale digital resources are typically developed and modified online, enabling information to be regularly updated for all users, in line with research and best-practice guidelines (Olff, 2015). As such, the

scaleable nature of DMHI could help to increase access to mental health information, treatment and support for large groups of people, with potential to reduce waitlists and burden on clinical mental health services (Kazdin, 2017; Olff, 2015).

Diverse Care Options. DMHI may be tailored to address the needs and preferences of the user. For example, DMHI may support users to improve their mental health literacy and social skills, facilitate symptom monitoring, or may provide them with therapy (Christensen & Hickie, 2010) while delivering it in a preferred format (Fleming et al., 2019). At this intersection of technology and mental health research, the needs and preferences of the user can be measured more accurately, DMHI can be designed to address these needs and preferences, and the number and diversity of mental health help options can increase to provide suitable options for more people (Fleming et al., 2016; Hollis et al., 2015; Peiris-John et al., 2020). For example, direct and serious mental health information, and fun or gamified approaches can both be developed to provide appropriate help to adolescents depending on their age, preferences, and mental health needs (Fleming et al., 2019). Customisation can also allow DMHI to be targeted to specific user groups to address specific mental health concerns of that population; for example, building DMHI that acknowledge Māori cultural needs and use Māori approaches and knowledge to support Māori mental health outcomes (Muriwai et al., 2015; Shepherd et al., 2015).

The ability to provide diverse care options for adolescents which suit their needs and preferences is aligned with a staged care approach. This enables people to access appropriate and relevant support at various stages of their mental health journey (e.g. mild, moderate, or severe distress and support with long term maintenance) (Fava & Kellner, 1993; van Straten et al., 2010).

Online Mental Health Help-Seeking. Research suggests that adolescents already use the internet to access mental health information and seek support from their peers whether or not they had a health concern themselves (Burns et al., 2010; Utter et al., 2017). Adolescents report that they would recommend the internet to a friend as an accessible and helpful medium to find sensitive health information (Burns et al., 2010; Kauer et al., 2014; Sweeney et al., 2019). Despite a lack of empirical research, researchers posit that the internet may help to reduce stigma and embarrassment associated with in-person mental health help-seeking (Berger et al., 2005; Fleming et al., 2016; Gulliver et al., 2010; Sweeney et al., 2019). In sum, this presents an

exciting opportunity to use the internet as a vehicle to deliver accessible DMHI that may address some of common barriers to mental health resources.

Previous research indicates that digital options may also appeal to adolescents experiencing distress, with those reporting distress accessing the internet to seek health-related information more than their non-distressed counterparts (Utter et al., 2017) and favouring web-based mental health interventions over those run in-person (Rickwood et al., 2016). Encouragingly, this suggests that online resources may be an effective and appropriate method of providing mental health help to distressed adolescents. DMHI could be especially valuable if they reached and appealed to adolescents who were experiencing distress, not just by providing online support but by acting as a gateway for in-person support seeking (Bucci et al., 2019; Stephens-Reicher et al., 2011). However, more research is required to ascertain whether DMHI are reaching this group when they are delivered in real-world settings (Baumel et al., 2019; Fleming et al., 2018; Torous et al., 2018).

Reducing Barriers to Mental Healthcare. Perceived stigma, lack of mental health knowledge, confidentiality concerns, and a desire to self-manage mental health concerns are repeatedly and internationally reported by adolescents as barriers to mental healthcare (Gulliver et al., 2010; Radez et al., 2020). Distributing mental health resources digitally may help to minimise adolescents' concerns about stigma, cost and confidentiality, and increase feelings of autonomy (Burns et al., 2010; Olff, 2015; Sweeney et al., 2019). Therefore, these resources may be especially valuable for groups who have had experienced mental health stigma or disempowerment in face-to-face mental health services and who want to access anonymous support in non-clinical environments, such as school or home (Christensen & Hickie, 2010).

The goal of DMHI is to improve access to mental health support among groups who may otherwise not access or seek help (Christensen & Hickie, 2010). This is possible due to the ability to scale-up digital resources at relatively low cost, reduce barriers to mental health support and their acceptability, particularly among adolescents (Andersson & Titov, 2014).

2.3.2 Types of DMHI

The possibility that DMHI could enable large-scale, equitable distribution of effective and appealing mental health resources is encouraging (Olff, 2015; Patel et al., 2018). The purpose of this thesis is to explore adolescents' DMHI access in real-world settings, as such, I

will focus specifically on DMHI that are designed for adolescents, that are free to access and that can be accessed autonomously (without a referral) in New Zealand. With these requirements in mind, I propose that there are three important categories of DMHI: those that provide information, those that provide therapy and those that provide personal, non-clinical support.



Figure 1. Basic model of three DMHI categories reviewed in this thesis

As demonstrated in Figure 1, DMHI are not typically provided as stand-alone resources; for example, resources may provide a combination of computerised psychotherapy and supplementary mental health information. This is an emerging field of research and there are numerous types of DMHI. Reviewing each in detail is beyond the scope of the current study; as such, Figure 1 is an indicative, but not exhaustive, representation of DMHI.

Information. Evidence-based mental health information or educational interventions (collectively, *psychoeducation*) can be delivered digitally and aim to shift away from therapist-led and towards self-help strategies to provide low budget, easy-to-comprehend and evidence-based information to the reader (Donker et al., 2009). Encouragingly, they may increase access to low-cost mental health information, and improve knowledge of depression, symptom identification, treatment adherence, and depression, anxiety and aggression outcomes (Bevan-Jones et al., 2018; Brijnath et al., 2016; Christensen et al., 2004; Donker et al., 2009; Tursi et al., 2013). For example, one pilot study in New Zealand reported significant reductions in symptoms of depression among adolescents experiencing low mood following 4 to 10 weeks of use of

digital psychoeducation (about physical and mental health, stress management and personal fulfilment) (Stasiak et al., 2014).

Beyond educational gains, psychoeducational resources can reduce personal depression stigma (Griffiths et al., 2004), and may be an effective first-step intervention for people experiencing mental distress (Donker et al., 2009), help guide adolescents to additional help resources (Rickwood et al., 2015), and be a suitable adjunct to other help options (Tursi et al., 2013). Adolescents have reported that digital psychoeducation is helpful (Stasiak et al., 2014), improves ease-of-access to information, and increases feelings of privacy and perception of autonomy, as they are seeking solutions to their concerns without supervision (Pretorius et al., 2019). This feedback is encouraging given that adolescents often report these variables as barriers to accessing mental health help (Radez et al., 2020; Rickwood et al., 2007; Wilson et al., 2011).

It is surprising that digital psychoeducation has not been studied more extensively given that adolescents already report using the internet to access mental health information, with those experiencing distress accessing information more often (Hall et al., 2019; Utter et al., 2017). Adolescents with probable psychological distress who participated in the Australia Youth Mental Health Survey (Hall et al., 2019) reported using online resources to access a variety of different information-based resources, including online quizzes or assessments (29.8%), searching for information on specific topics (37.3%) and looking for information about other available services (22.2%).

Poor reporting of real-world engagement data, the lack of appropriate control conditions, and inconsistent use of definitions in psychoeducation research make it challenging to ascertain the benefits of these resources (Bevan-Jones et al., 2018). Previous psychoeducation literature also tends to focus on adults, physical health conditions and non-digital interventions, leaving a lack of research investigating the benefits of digital psychoeducation for adolescents experiencing mental distress (Bevan-Jones et al., 2018). While this literature is promising, its application is limited as adolescents and adults have different needs, and translating psychoeducation into a digital format may affect outcomes (Brijnath et al., 2016). Given that adolescents are already reporting accessing these resources in a real-world setting (Hall et al., 2019; Utter et al., 2017), research on their safety and efficacy is necessary.

Computerised Psychotherapy. Psychotherapy is traditionally delivered in-person but some forms have been modified to enable users to access psychotherapy online or using applications (Fairburn & Patel, 2017). Complete computerised therapy provides therapy in its whole form and it intends to treat mental health disorder using the many of the same principles, structure and components as would be delivered in a face-to-face setting (e.g. Fleming et al., 2012). They may be unguided, referred to as self-help, guided by an external support person or clinician, or contain elements of both (Andersson & Titov, 2014; Erbe et al., 2017).

Preliminary research suggests that computerised psychotherapy may reduce specific symptoms of mental distress among specific groups of people (Ebert et al., 2015; Grist et al., 2019; Merry, Stasiak, et al., 2012). The most widely available (Marshall et al., 2020) and researched forms of computerised psychotherapy are computerised CBT (cCBT) but others include Acceptance and Commitment Therapy (ACT), and mindfulness-based cognitive therapy (Apolinário-Hagen et al., 2020; Fairburn & Patel, 2017; Grist et al., 2019). A full review of this literature is beyond the scope of this study (for a review, see Apolinário-Hagen et al., 2020; Grist et al., 2019), instead I narrow my attention towards computerised psychotherapy options that are suitable for adolescents, free to access and able to be accessed autonomously (without a referral) in New Zealand. Specifically, I focus upon cCBT as it is the most common computerised psychotherapy in adolescents (Fairburn & Patel, 2017) and relates directly to the current research methods.

Meta-analyses report cCBT has moderate to large effect on adolescent depression and anxiety (Ebert et al., 2015; Grist et al., 2019). These meta-analyses included BRAVE (Spence et al., 2011; Stasiak et al., 2018) and SPARX (Fleming et al., 2012; Lucassen et al., 2015) trials which have both been conducted among New Zealand adolescents, making them especially relevant for this study.

A 10-week BRAVE cCBT intervention resulted in significantly reduced anxiety symptoms among Australian adolescents (aged 12-18) with anxiety disorders when compared with a waiting list control condition (Spence et al., 2011). The BRAVE program was partially guided, including one 15-minute phone call after half the sessions were completed and a brief email to provide feedback after every session. BRAVE was also an effective online intervention for reducing symptoms of depression and anxiety among New Zealand young people (aged 7-15) with anxiety disorders following the 2011 Christchurch earthquake (Stasiak et al., 2018).

Similarly, a four to seven-week SPARX unguided intervention resulted in reduced symptoms of depression, anxiety and hopelessness, and significantly improved quality of life scores among New Zealand high school students that were seeking help for depression. Importantly, SPARX was equally as effective for male and female participants, across ages 12-19, for all ethnicities tested, and when completed through school or youth clinics. SPARX is also effective at reducing symptoms of depression among LGBTQI+ adolescents and alternative-education students in New Zealand (Fleming et al., 2012; Lucassen et al., 2015; Merry, Stasiak, et al., 2012). Additionally, improvements reported in BRAVE and SPARX programmes are comparable those in-person treatment-as-usual, and both reported improvements, and remained evident at least three-months post-intervention (Merry, Stasiak, et al., 2012; Spence et al., 2011).

In addition to their efficacy, adolescents report finding BRAVE and SPARX acceptable, engaging and helpful; the latter is considered engaging and helpful by Māori adolescents, students excluded from mainstream-education and sexual-minority adolescents (Shepherd et al., 2015, 2018; Spence et al., 2011). Together, these pivotal studies indicate that cCBT could be a scaleable and effective method of improving mental health outcomes among diverse adolescents and could act as a promising alternative or adjunct to in-person treatment.

In addition to being scalable, effective, and adolescent-approved, uptake and engagement with cCBT interventions in real-world settings needs to be adequate to enable positive clinical outcomes on a population health level (Baumel & Yom-Tov, 2018; Christensen et al., 2009; Donkin et al., 2011). In a controlled research setting, BRAVE and SPARX trials report low dropout rates and good engagement; 81% - 90.5% completed at least 4 of the 7 SPARX modules and 60% - 81% completed all modules (Fleming et al., 2012; Lucassen et al., 2015; Merry, Stasiak, et al., 2012; Spence et al., 2011). Yet, uptake and engagement of cCBT in a real-world setting is disappointingly low by comparison (Baumel et al., 2019; Fleming et al., 2018). For example, in a randomised controlled trial in a school-based setting, adolescents completed 9.4 of 28 exercises, whereas in a community setting a matched sample completed 3.1 of 28 of the same intervention (Neil et al., 2009). The disparity between controlled trial uptake and real-world use is evident in the literature (Baumel & Yom-Tov, 2018; Fleming et al., 2018), but it remains unclear who the adolescents are that are engaging in a real-world setting and their mental health status in relation to those who do not engage.

Personal, non-clinical support. Mental health support offered through webchat, telephone or text message provides free, synchronous (real-time), personal, and non-clinical support and information. They are typically staffed by trained counsellors, helpline volunteers and peer-support workers and are often offered in conjunction with other DMHI, such as psychoeducation (Youthline, 2019). Many of these services function 24/7, are free, accessible from anywhere with phone service enabling the caller to remain anonymous, minimising cost, concerns about privacy and geographical barriers (Fukkink & Hermanns, 2009; Gibson & Cartwright, 2014; Youthline, 2019). In contrast to complete psychotherapy, personal, non-clinical support aims to provide support or information within one interaction and typically does not provide professional or complete psychotherapy (Fukkink & Hermanns, 2009).

Hoermann, McCabe, Milne, and Calvo (2017) systematically reviewed interventions providing personal phone-based mental health support and found mixed, but overall positive, findings. However, of the 21 studies included in this review, only 14 were included in the efficacy review, and of these, only seven included adolescents. Of the seven studies that included adolescents, one was stopped due to low recruitment rates (Crutzen et al., 2014), one provided clinical support (Dowling & Rickwood, 2015) and two were examining the effect of multiple sessions on mental health (Kramer et al., 2014; Wentz et al., 2012). The remaining three relevant studies reported significantly reduced suicidal intent and improved mental state following a one-off phone call among under 18s (King et al., 2003); reduction in distress among adolescents following a one-off web-chat conversations (mean age 15.4 years) or one-off phone call (mean age 13.1 years) (King et al., 2006); and, increased wellbeing and reduced emotional burden following a one-off phone call (mean age 13.8 years; Fukkink & Hermanns, 2009). Encouragingly, the increased wellbeing and reduced emotional burden benefits reported by Fukkink and Hermanns (2009) were still evident at one-month follow-up.

There is, however, less empirical evidence investigating the effect of webchat- and text message-based support. Previous research appears to focus upon the experience of the service user; for example, Sindahl et al., (2019) report that both suicidal and non-suicidal adolescents felt helped by a text support conversation, 47.1% and 65.5% respectively, and many went on to seek further help from a trusted support person. However, the short- and long-term effect of these interventions upon adolescents' symptomology remains unclear.

Despite the lack of empirical evidence for their safety, efficacy and reach, adolescents are using personal, non-clinical mental health support services internationally. According to the Australia Youth Mental Health Report (Hall et al., 2019), 23.2% of adolescents with psychological distress reported using the internet to chat privately with someone with a similar lived experience, and telephone hotlines were used by adolescents both with and without probable psychological distress, 17.6% and 17.3% respectively, to help with important issues. Interestingly, Haner and Pepler (2016) report that more sexual and ethnic minority adolescents engaged with webchat support than phone calls, suggesting that offering a selection of help options may help to engage different groups.

Despite the concerns that using digital technologies to offer mental health support will hinder interpersonal connection between the adolescent and their support person, this mode of delivery appears to provide adolescents with a less confronting option to talk about their personal or sensitive issues (Leibert & Archer Jr., 2006; Suler, 2005), reduce power imbalance between the parties (Suler, 2005), and may provide a first point of contact to adolescents who want support (Gibson & Cartwright, 2014).

In sum, the literature investigating the use of personal, non-clinical mental health support delivered through text message, phone or webchat is promising, but limited. Early research suggests that adolescents may experience short-term relief of distress but that personal non-clinical support should be used as a gateway to in-person support seeking, rather than a complete treatment option (Sindahl et al., 2019). Additionally, adolescents are already using phone calls, text messaging and webchat to access personal, non-clinical mental health support (Haner & Pepler, 2016; Youthline, 2019). Thus, further investigation into the efficacy and safety of these interventions, their short- and long-term benefits, and the demographics and mental health needs of users is essential. Methodologically, this research is challenging to undertake due to the brief and one-off nature of these contacts, the user often remaining anonymous and, that waitlist or no-treatment conditions are typically not included in the study (Coveney et al., 2012; Fukkink & Hermanns, 2009; King et al., 2006).

Combined Approaches. Considering the multifaceted nature of adolescent health and preferences, it is unlikely that one standalone application or approach will completely meet individuals' needs (Bidargaddi et al., 2017; Fleming et al., 2019). Combined approaches respond to this concern by offering multiple approaches on one platform. However, it is challenging to

distinguish between which active DMHI component, or which combination, are benefitting the user, resulting in a lack of research investigating combined approaches, even though DMHI are rarely being offered in isolation in a real-world setting (Bidargaddi et al., 2017). One example of a combined approach in a real-world setting is SPARX (www.SPARX.org.nz), whose primary intervention is cCBT but includes personal, non-clinical support options and information on the website.

Alternatively, ‘hubs’ such as Intellicare (Kwasny et al., 2019; Mohr et al., 2017) and Youth19 resources (<http://info.youth19.ac.nz/>), provide an array of different DMHI with the intention of catering to a wide range of individuals’ needs and preferences. Early research suggests that this approach is promising. Adults with symptoms of anxiety or depression engaging with IntelliCare hub apps for 8-weeks experienced reduced depression (PHQ-9) and anxiety (GAD-7) scores. Some specific apps were associated with reductions in symptoms of anxiety and/or depression; however, as users were engaging with a combination of apps it is unlikely that improvements were due to use of one single app (Kwasny et al., 2019; Mohr et al., 2017).

Using a similar combined approach young Australians (16-25 years) were offered access to a 4-week “Toolbox” of health and wellbeing interventions and a recommendation service based on answers to an interactive quiz. No psychological, social or emotional improvements were made from used this combined approach; however, improvements in mood, sleep, rest, and energy were seen by those who logged in to the service more regularly (Bidargaddi et al., 2017).

Importantly, adolescents also respond favourably to combined approaches, reporting that it could improve user autonomy and choice (Fleming et al., 2019; Peiris-John et al., 2020). During Youth19 survey co-design, adolescents provided positive feedback to the idea of integrating DHR and DMHI into Youth19 survey, a large youth health and wellbeing survey conducted in New Zealand. They did, however, indicate that privacy should be carefully considered and assured to recipients of these resources (Peiris-John et al., 2020).

2.3.3 Challenges for DMHI

DMHI are a promising method of delivering mental health information and support to adolescents but, as reviewed above, each type has its strengths and weaknesses. In addition to these, there are some overarching challenges that arise from the use of the digital platform for

mental health support. To ensure that the future development of resources addresses these challenges, it is important that they are considered and reflected upon throughout the research process.

Equity and Internet Access. Adolescents use the internet for a multitude of purposes, including entertainment, communication and accessing information (Lenhart et al., 2015) with over 90% of students in New Zealand access the internet daily (Utter et al., 2017); thus, digital technology could be an appropriate and effective medium to reach adolescents to deliver DMHI. In fact, DMHI are proposed to be an accessible and equitable option to providing mental health interventions, particularly useful for those who would otherwise forgo mental health support (Fleming et al., 2016; Rogers et al., 2017). However, New Zealand adolescents from higher deprivation groups are less likely to have their own cell-phone and regularly share technological devices with family members (Hartnett, 2017). This “digital divide” is also evidenced by differences in internet use between low and high deprivation groups, the former being more likely to access the internet for health-related information (Utter et al., 2017). Thus, considering that a goal of DMHI is to reduce inequities (Muñoz et al., 2019; Peiris-John et al., 2020), it is essential that their development does not exacerbate existing disparities in access to care and mental health outcomes among New Zealand adolescents.

Quality Assurance, Guidelines and Regulations. There are a large and fast-growing selection of commercial and widely available mental health apps for those that can and choose to engage with DMHI (Marshall et al., 2020). Many claim they are evidence-based because of their influence from psychotherapeutic interventions, but concerningly, most have a distinct lack of theoretical or empirical support (Larsen et al., 2016, 2019; Neary & Schueller, 2018). This is of current and global interest due to the increased requirement for high-quality and safe mental health interventions that people can use while social-distancing during the coronavirus disease 2019 (COVID19) pandemic (Duan & Zhu, 2020; Fischer et al., 2020).

Information-based websites are, too, typically of mixed, but often low, quality (Christensen & Griffiths, 2000; Reavley & Jorm, 2011). To ensure the high-quality dissemination of DMHI, efficacy and privacy of the intervention should be addressed by commercial and research developers, and communicated to users so they have the tools to examine DMHI quality and safety (Kretzschmar et al., 2019; Neary & Schueller, 2018).

Privacy. For transparency, privacy policies should also be communicated clearly (Kretzschmar et al., 2019). DMHI, if transparent and secure, offer a valuable opportunity to address adolescents' confidentiality concerns when seeking mental healthcare (Radez et al., 2020). Within New Zealand, for example, privacy concerns are reported as a barrier to healthcare by 39% of high school students experiencing emotional concerns, with students who reported high depressive symptoms being more likely to report privacy as a barrier to healthcare than those reporting fewer depressive symptoms (Denny et al., 2013).

Despite DMHI potential to address some existing privacy concerns, digital resources do present new challenges, including secure data storage, ethical use of users' personal information, transparency of privacy and safety information, and managing risks of hacking and extortion (Kretzschmar et al., 2019; Martinez-Martin & Kreitmair, 2018; Patel et al., 2018). Concerningly, adolescents' may *perceive* that digital options are more private than in-person conversations with healthcare professionals, but given the aforementioned digital challenges, this is unlikely the case (Kenny et al., 2016; Torous et al., 2019).

Digital Therapeutic Alliance. Another issue that faces DMHI is the difficulty of culturing a therapeutic alliance, considered a fundamental component of mental healthcare and predictive of positive outcomes in mental health therapy (Helton, 2003; Karver et al., 2006; McLeod, 2011). This therapeutic alliance talks to the working relationship between practitioner and client that involves an affective bond, and agreement on tasks to reach shared goals (Bordin, 1976). Transferring practitioner skills, developing strong therapeutic relationships and assuring privacy on a digital platform may impact the ability to build a therapeutic relationship and, as such, could impact on the efficacy of intervention (Helton, 2003). More research on the interplay between privacy, safety, efficacy, data sharing with health professionals, personalisation and engagement is required to explore the promise and limitations of digital therapeutic alliance (Henson et al., 2019).

Real-World DMHI Uptake. A combination of the aforementioned challenges may contribute to an adolescents' decision to opt-in, register to, or initial access with DMHI (collectively, *uptake*), and engage in ongoing use, or complete of a module or programme (collectively, *retention*). Adequate uptake and retention in a real-world setting (hereafter, *engagement*) are both required for a DMHI to be effective on an individual and population level (Baumel & Yom-Tov, 2018; Christensen et al., 2009; Fleming et al., 2018). However, previous

research has consistently reported large disparities between uptake and engagement in randomised controlled trials and real-world settings (Baumel et al., 2019; Christensen et al., 2009; Fleming et al., 2018).

Despite numerous commercial DMHI being available on app stores, there is limited uptake and retention data available in a real-world setting. Fleming et al., (2016) proposes four action areas required to improve the uptake of DMHI in real-world settings, one of which is effective testing and measuring of interventions available in a real-world setting. Within that action area, it is important to examine how many people engage with DMHI in real-world settings and who those people are (Fleming et al., 2018; Sanatkar et al., 2019; Schueller et al., 2019). In New Zealand, adolescents who are female, older, and living in lower deprivation neighbourhoods are more likely to report previous autonomous use of the internet to find health-related information (Utter et al., 2017). Interestingly, users of an Australian online counselling service for those aged 12 to 25 were also more likely to be female, older and experiencing more distress than those who used the equivalent in-person counselling service (Rickwood et al., 2016). Together, this literature suggests that real-world access to DMHI is low and *who* accesses DMHI in a real-world setting may differ to those accessing in-person.

Traditionally, data analytics are used to report the age and location of the website user; however, researchers, developers and mental health clinicians could benefit greatly from knowing more comprehensive information about the demographic characteristics and mental health status of the user. This could provide valuable insight about what resources, technology and delivery methods are, *or are not*, working, and for whom. In turn, this may enable future iterations to be tailored towards groups who enjoy engaging with digital interventions or modified to better suit the needs and preferences of those who are currently not engaging. Most importantly, this demographic and mental health data can be used to investigate whether DMHI are reaching those in need of them and not exacerbating existing mental health disparities. It is therefore valuable to investigate new approaches that enable researchers to securely collect this data and explore the resulting real-world DMHI access data.

Chapter 3: Rationale for Current Thesis

Concern regarding the increasing reports of adolescent mental distress (T. Clark et al., 2014; Keyes et al., 2019; Patel et al., 2007; Twenge et al., 2019) and the overburdened mental healthcare system (K. Allan, 2018) has resulted in significant commercial and research interest into how digital technologies can improve access to help and mental health outcomes (Hollis et al., 2015, 2017). Delivering help digitally seems particularly appropriate given adolescents already interact with digital devices for entertainment, communication and accessing information (Lenhart et al., 2015), already report using the internet and digital resources to access mental health information (Utter et al., 2017), and generally consider digital methods an acceptable means of accessing support (Fleming et al., 2019; Grist et al., 2019; Hall et al., 2019).

Emerging literature suggests that some DMHI may help to improve mental health knowledge and reduce symptoms of mental disorder among adolescents (Bevan-Jones et al., 2018; Ebert et al., 2015; Grist et al., 2019; Hollis et al., 2017; Kauer et al., 2014). Encouragingly, these resources may reduce the personal and structural barriers adolescents experience to receiving mental healthcare (Burns et al., 2010; Gulliver et al., 2010; Radez et al., 2020), and so may enable the widespread, low-cost distribution of mental health resources (Olf, 2015).

Despite the promise of these DMHI, real-world engagement with them is disappointing (Fleming et al., 2018; Torous et al., 2018). It is currently unclear *which* adolescents access these resources in a real-life setting and whether these DMHI are reaching the adolescents who experience mental distress (Fleming et al., 2018; Rickwood et al., 2007, 2016).

Leading adolescent health researchers in New Zealand are using an innovative approach to deliver DHR and DMHI to high school students by integrating resources, using a combined approach, into the longstanding Youth19 health and wellbeing survey (Fleming et al., 2020) (Peiris-John et al., 2020). The combination of quantitative survey data and observational DMHI uptake data provides a unique opportunity to explore adolescent uptake of DMHI in a real-life setting. In this thesis I explore which adolescents access the DMHI, specifically asking do adolescents experiencing current mental distress access DMHI.

Chapter 4: Methods

4.1 Introduction

Understanding more about the way adolescents interact with DMHI in a real-life setting is essential to ensure useful and accessible resources are being provided in research, clinical and community settings. In this thesis, I investigate how adolescents who are experiencing mental distress engage with DMHI following the completion of the Youth19 survey.

4.1.1 Methodology

Critical realism underpins my approach to understanding adolescent uptake of DMHI. A critical realist perspective assumes that there is a “reality”, but that this is socially constructed and interpreted differently by people dependent on their experiences, positioning, perspectives and biases (Sayer, 1992). In the context of the current study, a critical realist perspective suggests that there are some objective truths regarding adolescents’ interest and engagement with DMHI, and that theoretical and empirical research will help researchers more thoroughly understand these behaviours. However, at the same time, I assume that adolescents, mental health, digital resources, and researchers are influenced by social systems and contexts, both big (e.g. a sense of personal responsibility for health outcomes) and small (e.g. completing the survey in school classrooms and halls), which influence the findings and interpretation of the findings. Therefore, despite our best efforts to understand the ‘truth’ about DMHI, the answer will always be complex and contextual.

Relying on traditional positivist methodologies may lead to a reductive understanding of health, mental health and effective treatments. That is, interventions with non-significant findings and small effect sizes may be interpreted as ineffective. In contrast, investigating adolescent DMHI uptake using a critical realist perspective allows me to make use of empirical research methods and theory to shape my understanding of DMHI, critique the literature and contextualise these findings in the social-cultural environment. This is especially valuable when discussing the research, clinical and policy implications of these findings.

4.1.2 Rationale for Collaborating with Youth19

Youth2000 is a series of cross-sectional health and wellbeing surveys conducted among adolescents in New Zealand. Youth2000 surveys were conducted in 2001, 2007, 2014 and 2019.

The 2019 wave of Youth2000 (hereafter, Youth19) was conducted by the Youth19 Research Team, led by Dr Terryann Clark and Dr Theresa (Terry) Fleming.

The Youth19 survey provided a valuable opportunity to investigate New Zealand high school students' engagement with DMHI in a real-life setting using a Smart Survey approach. Detailed information about the participants and their mental health was collected in the Youth19 survey. Digital DHWI were integrated into the survey, providing a valuable opportunity to measure each participants' interaction with these resources in a real-world setting. This combination of quantitative survey data and observational DMHI uptake data is an innovative method of investigating engagement with digital resources in a real-world setting. Using the Youth19 survey infrastructure in this way also offers a unique opportunity to explore DMHI uptake and access in a real-world setting without the logistical and resource challenges that would be involved if this work was undertaken independently (indeed, such a project would be challenging to design and complete within the financial and time limitations of a master's thesis). In particular, working with the Youth19 group also increases likelihood that this research will achieve the sample size necessary for meaningful analysis. While it may have been possible to run a smaller study independently, sample sizes would have been considerably smaller, making it more difficult to provide meaningful data and generalise findings. Given these constraints and the appropriateness of the data, I decided to collaborate with Youth19 for this thesis.

4.1.3 My Role in Youth19 and Thesis Research

My collaboration with Youth19 Research Group allowed me to personally contribute across many aspects of survey and resource development. My personal contributions to the Youth19 project were:

- Contributing to the refining of Youth19 survey emotional wellbeing items. The Youth19 Research Team assembled the survey questions. I contributed by reading, checking, and providing comments on the emotional wellbeing items.
- Contributing to the writing of criteria for DMHI. For example, the Youth19 Research Team proposed to include DMHI as part of the DHR offered to participants at the end of the Youth19 Smart Survey. Criteria was developed by the research team and refined with stakeholders and adolescents (Peiris-John et al., 2020). I contributed to this process by discussing criteria with the research team.

- Collaborating with Youth19 research group to propose DMHI. Once the DMHI criteria had been confirmed, I proposed some DMHI options to the Youth19 Research Team for consideration.
- Contributing to the writing of descriptions for DMHI on the Youth19 website. The research team wrote and edited all DHR descriptions. I contributed by writing and editing the DMHI descriptions with other members of the research team.
- Collaborating with Youth19 Research Team and designer to develop visual and functional elements of Youth19 website. I was part of the team that met with the designer to brainstorm and draft the website design.

I also led all aspects of my own thesis research, including:

- Developing and refining research questions
- Writing of thesis proposal, Youth19 data access proposal, and thesis
- Analysing data

This chapter is in two parts. In section 4.2, I introduce and describe the Youth19 survey and its methods. In section 4.3, I describe the participants, the materials and planned data analysis for the current study.

4.2 Youth19 Methods

In this section I will provide a brief description of Youth19 methods to provide adequate context for the current study. For further detail, refer to Youth19 Initial Findings: Introduction and Methods report; hereafter, referred to as Youth19 Methods Report (Fleming et al., 2020).

4.2.1 Design

Youth19 uses a mixed methods sequential design. The Youth19 survey and digital DHWI were developed using a community-based participatory research approach. The Youth19 survey was then conducted between May and September 2019.

4.2.2 Youth19 Survey

The survey is an output of two Health Research Council funded projects: *Harnessing the Spark of Life* investigates the role of whānaungatanga in the health and wellbeing of rangatahi

Māori and their whānau, and *Integrating Survey and Intervention Research for Youth Health Gains* investigates the uptake of digital health resources among survey respondents.

The Youth19 survey was administered on Lenovo TB-7104F, Acer B1-770 or Lenovo TB3-710 touchscreen handheld tablet devices; hereafter, tablet. A custom android application, created by the Youth19 research team, displayed the web-based Qualtrics survey which could be completed in English or te reo Māori.

4.2.3 Youth19 Resources

Upon completion of the survey, participants were able to opt-in to receiving DHR that were relevant to the survey content. The resources, publicly available at <http://info.youth19.ac.nz/>, were collated by the Youth19 research team and reviewed by the Adolescent Health Research Group, representatives from the Health Promotion Agency, and adolescents.

To be included in the Youth19 website, resources were required to be appropriate for 12 to 18-year olds; free to assess; publicly available in New Zealand; relevant for New Zealand audience; supported or funded by health or social government agencies; evidence-informed; content created explicitly to support the mental health and wellbeing of users; and, include content relevant to Youth19 Survey questions. Resources were excluded if they contained insensitive content, were difficult to navigate, may be triggering, or did not provide links to external help options, such as emergency services.

The homepage contains the logos of the universities involved in the Youth2000 survey series, the Youth19 logo, and the statement “Everyone has a hard time sometimes, check out these topics for info and options”. The navigation tab provides options to navigate to internal topic pages (Figure 2). General information about how to ask for help and the Youth19 survey is available through ‘get help’, ‘what if it’s hard’ and ‘about’ links.

Multiple resources are displayed within each topic page. An image from the website, a brief description of what help that website may provide, and links to help options within that website are displayed for each resource (Figure 3 and 4). The “feeling down” page includes DMHI from seven external websites: The Lowdown; allright.org.nz; SPARX; depression.org; Aunty Dee; What’s Up?; and Quest (Figure 3 and 4).

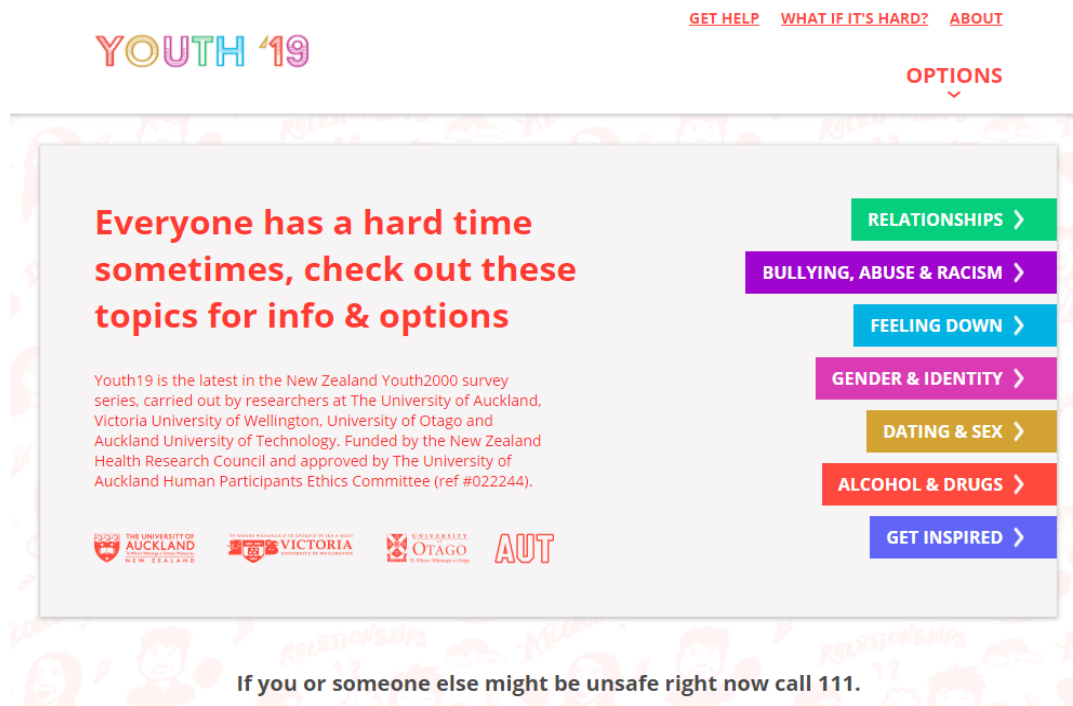


Figure 2. Screenshot of homepage on Youth19 website

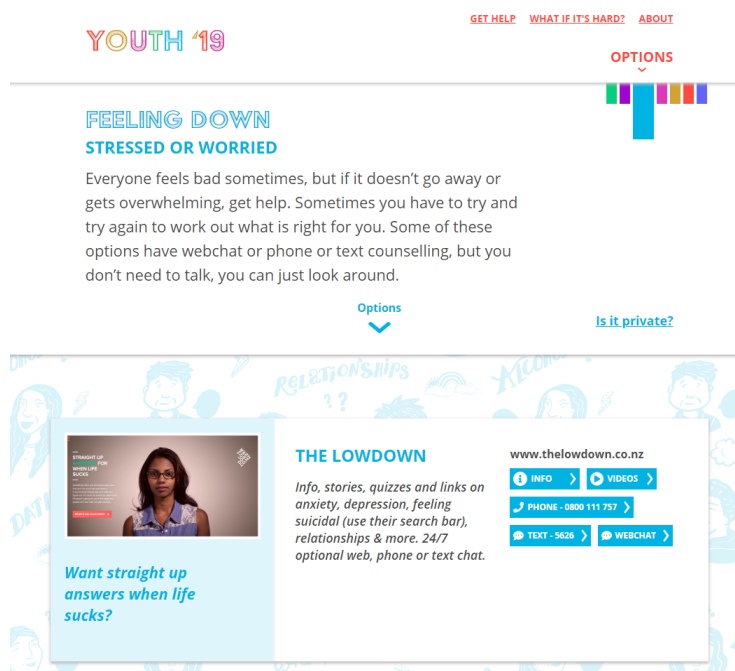


Figure 3. Screenshot of “feeling down” page on Youth19 website

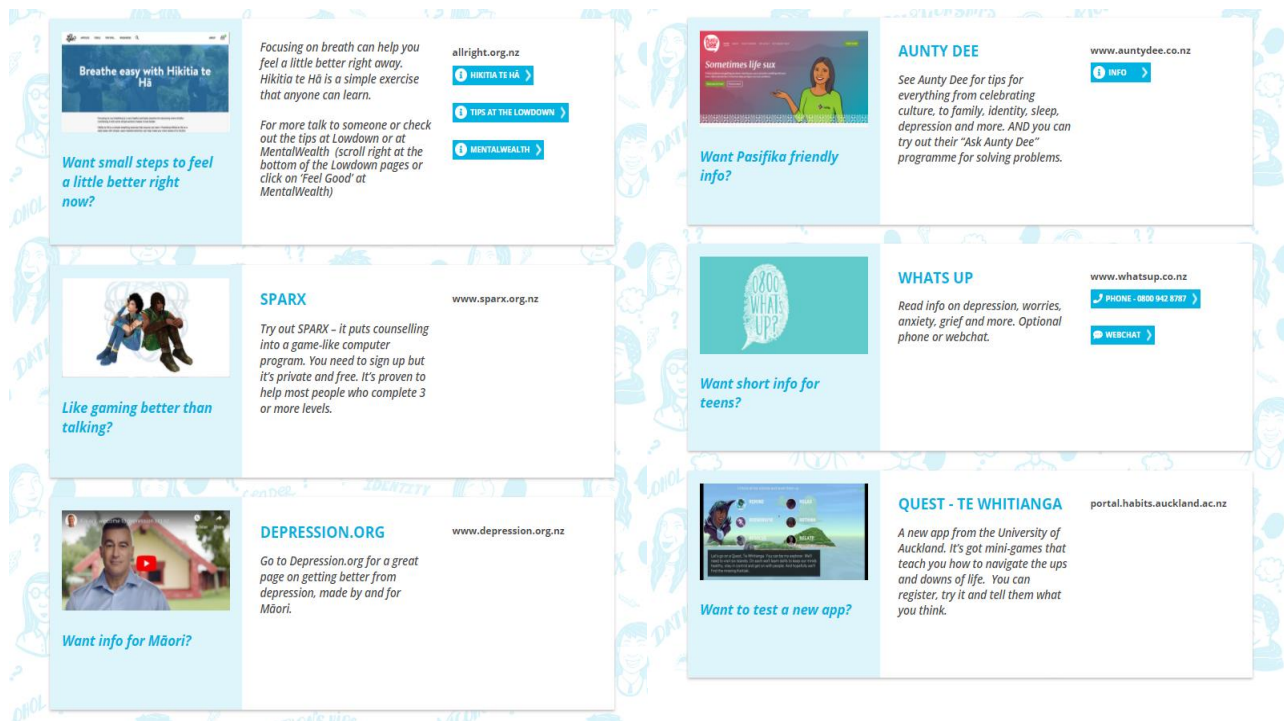


Figure 4. Additional screenshots of “feeling down” page on Youth19 website

4.2.4 Piloting

Initial pilot testing of software, hardware, and Youth19 survey involved Youth19 research group and research colleagues at Victoria University of Wellington. Pilot testing was then run at two eligible mainstream secondary schools.

4.2.5 Sampling

Two-stage random cluster sampling was used to randomly select participating schools and students (Fleming et al., 2020).

To be eligible to participate, secondary schools needed to be located in the Waikato, Auckland and Tai Tokerau regions of New Zealand and have over 50 students enrolled in years 9 to 13 (Fleming et al., 2020). Of the 86 schools invited, 49 (56.98%) agreed to participate in the Youth19 survey. To be eligible to participate, students needed to be enrolled in years 9 to 13 at a participating high school, and physically and mentally capable of completing the survey on a handheld tablet in English or te reo Māori. Over 30% of eligible students from each participating

school were invited to participate. Of 12,845 eligible students invited, 7721 (60.11%) accepted (Fleming et al., 2020).

Students were not required to provide a reason for declining to participate and could stop participating at any point during the survey. Most adolescents who did not take part simply did not turn up to the data collection period. They may have been ill, forgotten or actively decided not to do it. Overall, 49 students arrived in the room and then, upon hearing about the survey, declined to participate, and 12 students provided informed consent but answered three or less questions. These responses were excluded from the dataset (Fleming et al., 2020).

4.2.6 Procedure

Surveys were conducted in classrooms, libraries, school halls, or gymnasiums. To ensure privacy, appropriate space was left between participants and researchers stood at a distance. Youth19 research team provided students with a tablet. Participants were instructed to watch a two-minute introductory video which detailed the study details, purpose, how their information was anonymous and would be kept separate from personal details, and informed consent process. After the video, participants provided informed consent by completing a form on the tablet. Participants accessed the survey using a unique survey access code. Researchers were available to answer questions while participants were completing the survey. On average, the survey took 46 minutes to complete (Fleming et al., 2020).

After completing the questionnaire but before being given the option to opt-in, all participants were displayed an example of the text or email that they would receive if they chose to opt-in to receive DHR (Figure 5). Additionally, each participant received safety information and help options on a business card (Figure 6).

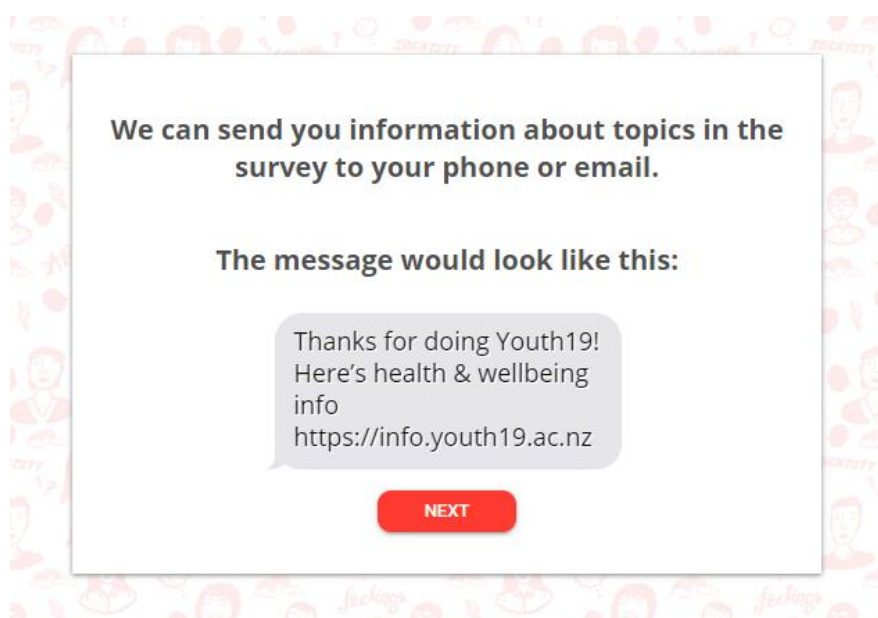


Figure 5. Screenshot of message displayed to participants at the end of Youth19 Smart Survey

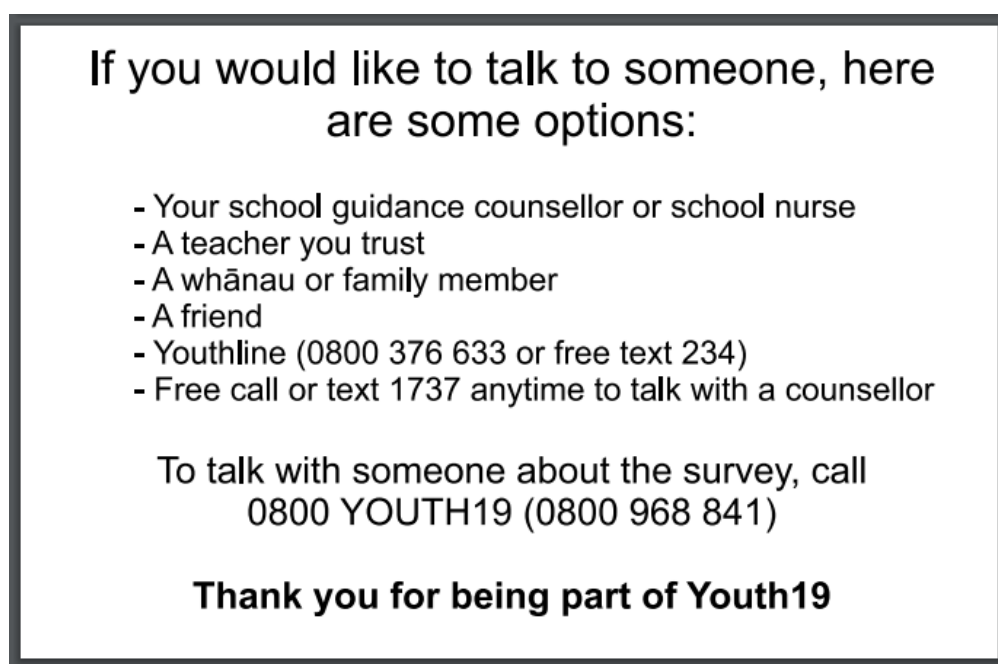


Figure 6. Safety information and help options provided at end of Youth19 Smart Survey

Data storage

In line with the Youth19 ethics protocol, all survey data was encrypted and stored on password protected secure computers. Only authorised investigators had access to data.

Ethics

The Boards of Trustees and principal from each school were provided with Youth19 study information and were requested to provide informed consent for their students to take part. The parents or guardians of participating students were provided information about the survey and not required to provide permission but were able to withdraw their child(ren) from the study. The Ethics Committee provided approval for this passive parental consent process to avoid poor response rates and smaller, less representative resulting sample sizes. Students were able to withdraw themselves from the study. Ethical approval granted by The University of Auckland Human Participants Ethics Committee (#022244).

4.3 Current Study Methods

With the opportunity provided by Youth19, this study explores probably distressed adolescents' uptake of DMHI following the completion of the Youth19 survey. In this section, I present the methods used in the current study, including the participants, the materials used and planned data analysis.

4.3.1 Participants

As outlined in *4.1 Introduction*, Youth19 survey participant data was used in the current study. A total of 7721 high school students participated, 5545 (71.8%) from Auckland, 1248 (16.2%) from Tai Tokerau and 928 (12%) from Waikato. The majority of participants were enrolled in mainstream secondary schools (95.5%) and 0.5% were enrolled in kura kaupapa Māori.

Participants were enrolled in Years 9 to 13; 18.2% were aged 13 or under, 22.6% aged 14, 22.0% aged 15, 19.1% aged 16, 18.1% aged 17 or over. Over half the sample (54.13%) identified as female, 44.97% as male, 0.62% as unsure, and 1.01% as transgender¹. The majority

¹ Due to small sample sizes of participants who reported their gender as unsure and transgender, to guard against spurious findings, these participants are removed from gender analyses

of participants (39.8%) identified as New Zealand European and other European, 23.0% as Asian, 19.8% as Māori, 12.2% as Pacific, and 5.0% as Other (includes Middle Eastern, Latin American, African, Other Ethnicities and ethnicity unknown).

4.3.2 Measures

Demographic Measures. All demographic data in the survey was self-report. Participants reported their age selecting from the following age bands: under 12, 13, 14, 15, 16, 17, 18, 19 or over; and, reported their gender selecting from: boy/man, girl/woman, or I identify in another way.

Participants indicated their ethnicity from the 180 ethnicity options, as per the Statistics New Zealand (2017) level 4 ethnicity classification; participants could select as many as were applicable. Those who selected multiple ethnicities were categorised to one using the New Zealand census ethnicity prioritisation method (Fleming, Peiris-John, et al., 2020).

Participants reported their primary address to determine neighbourhood socioeconomic deprivation, as per standard procedure for Youth19 analyses (Fleming, Peiris-John, et al., 2020). The participants' primary address were used to determine their meshblock (census-derived small geographical area) and, from this, neighbourhood socioeconomic deprivation was identified according to the New Zealand Deprivation Index. This scale spans from 1 (least deprived) to 10 (most deprived). For the current study, data was grouped into low (1 to 3), medium (4 to 7) and high (8 to 10) levels of neighbourhood socioeconomic deprivation.

The deprivation of the participants' school was also recorded according to the New Zealand school decile system. This scale spans from 1 (most deprived) to 10 (least deprived). For the current study, data was grouped into low (1 to 3), medium (4 to 7) and high (8 to 10) decile. This is consistent with the main Youth19 analyses (Fleming, Peiris-John, et al., 2020). For clarity regarding the opposing scoring systems, New Zealand deprivation index has an ascending scale meaning those high on this scale experience high levels of deprivation in contrast to the school decile system scoring which is descending meaning high decile schools experience lower levels of deprivation.

Distress Symptom Measures. All demographic data in the survey was self-report. Youth19 survey answers were used to determine participant levels of current mental health distress. RADS-SF and GAD-2 were used to measure current mental distress due to both being

self-report measures and indicating how the participants have felt *in the previous two weeks*. These measures were selected to provide insight into the participants' current mental distress, rather than other questions which pertain to their mental health within the last 12 months.

Symptoms of Depression. The Reynolds Adolescent Depression Scale - Short Form (RADSF; Reynolds, 2008) was used to measure symptoms of depression. The scale consists of ten self-report items taken from the original Reynolds Adolescent Depression Scale (RADSF; Reynolds, 1987). Specific questions are not reported as this measure is copyrighted. Participants indicate their response to the questions on a 4-point scale; 1 (almost never), 2 (sometimes), 3 (about half the time), 4 (most of the time). The maximum score on the RADSF is 40 with a higher score indicating increased symptoms of depression. This study will use a cut-off of 28 to indicate clinically significant depressive symptoms; this cut off provides higher overall agreement (95.2%) with the RADSF classification compared with previous recommendation of 26 (93.1%; Milfont et al., 2008). RADSF cannot be used to infer that a participant has a clinical diagnosis of depression but that their symptomology warrants further clinical assessment (Szabo et al., 2014). RADSF is considered a reliable and valid self-report measure for adolescents aged 12 - 18, male and female participants, and the five major ethnic groups in a New Zealand adolescent sample (Maori, Pacific, Asian, NZ European, and other; Milfont et al., 2008; Walker et al., 2005). Previous research indicates that the RADSF has good psychometric properties and is an appropriate, reliable and valid measure to use among New Zealand adolescents to screen for symptoms of depression (Milfont et al., 2008; Ortuño-Sierra et al., 2017; Szabo et al., 2014).

Symptoms of Anxiety. The Generalised Anxiety Disorder Scale-2 (GAD-2; Kroenke et al., 2007) is a self-report 2-item brief measure, selected by the Youth19 research team, to indicate levels of anxiety in adolescents. Participants indicate how often in the previous two weeks they have been "feeling nervous, anxious or on edge" or "not being able to stop or control worrying" on a four-point scale; 0 (not at all), 1 (several days), 2 (more than half the days), 3 (nearly everyday scale). The maximum score on the GAD-2 is 6 with a higher score indicating increased levels of anxiety. This study uses a cut-off score of 3 to indicate a level of anxiety that warrants additional clinical evaluation for anxiety disorders (Arroll et al., 2010; Kroenke et al., 2007; Plummer et al., 2016). As with the RADSF, GAD-2 cannot be used to infer that a participant has a clinical diagnosis of anxiety but can indicate that the individual is experiencing

some symptoms of anxiety that warrant further clinical assessment. GAD-2 is considered a brief self-report indication of possible symptoms of anxiety. Acceptable sensitivity (0.76) and specificity (0.81) are reported using a cut off of 3 but more validation studies among adolescents are required (Arroll et al., 2010; Kroenke et al., 2007; Plummer et al., 2016).

Opt-in and Access Measures. Data was retrieved on 22nd August 2020, thus, reported data reflects participant opt-in and access between the date the Youth19 survey was conducted in each school (May to September 2019) and 22nd August 2020.

4.3.3 Data Analysis

This research aims to: (i) examine adolescents' uptake of DMHI in a real-life setting, and (ii) determine whether adolescents who are experiencing probable mental distress are more likely to access these resources compared to those who are not experiencing probable mental distress.

In 5.2 *Youth19 Results*, school and participant response rates and demographics are provided to familiarise the reader to the current study sample. Then, I report the rates of probable mental distress within Youth19 sample, including probable symptoms of anxiety and probable symptoms of depression. In 5.3 *Current Study Results*, descriptive and inferential statistics are reported for Youth19 DHR opt-in and DHR access.

Sample size and power calculations were conducted by the Youth19 research team to ensure that adequate sample size and representation was achieved so prevalence estimates could be calculated. The current thesis is exploratory in nature with an interest in describing adolescent uptake of DMHI; thus, no post-hoc sample size or power criteria were implemented. Given low numbers of DMHI access, statistical analyses would be inappropriate so DMHI access are simply described.

As per Youth19 data access protocols, all raw data were provided as the number of participants in each group. For example, age was banded (i.e. under 12, 13, 14, 15, 16, 17, 18, 19 or over) and the number of participants in each age band who opted-in (or not) was reported. As such, chi-squared tests analysed relationships between opt-in and assess status with demographic characteristic and probable mental distress. In addition, the Youth19 research team provided weighted percentages for key variables of interest (see for example Table 3). These percentages were adjusted in two ways to provide prevalence estimates. First, the sampling of schools and participants resulted in each individual having an unequal probability of being invited to, and

participating in, the Youth19 survey. Inverse probability weights were calculated to account for this. Second, the prevalence estimates were weighted to represent the adolescent population in the Northern Regions (Waikato, Auckland, Tai Tokerau). Population-level sex, age, ethnicity and school decile data from the Education Counts website was used by Youth19 researchers for weighting (manuscript in preparation). All weighted prevalence estimates are presented with a 95% confidence interval (CI). Inferential statistics presented in this thesis were conducted based on the raw numbers of participants, and so the 95% CIs of the population estimates differ slightly from the chi-squared analyses.

A small proportion (3.3%) of the overall sample did not provide enough data to calculate their probable symptoms of depression and probable symptoms of anxiety. These participants with missing data were excluded from analyses focusing on probable mental distress.

Chapter 5: Results

The aim of this research is to explore adolescents' access to DMHI in a real-life setting. To provide necessary context to address this aim, *5.1 Youth19 Results* provides relevant Youth19 descriptive statistics, including school and participant response rates, characteristics of the surveyed schools, the participants' demographic data and the participants' reports of probable mental distress. To address the current research questions, *5.2 Results for Current Study* reports participant opt-in to the DHR, access to DHR and access to the DMHI.

- 1) How many New Zealand high school students experiencing probable mental distress opt-in to and access DHR available through the Youth19 survey?
- 2) How does this compare to New Zealand high school students who are not experiencing probable mental distress?
- 3) Are New Zealand high school students that are experiencing probable mental distress more likely to access DMHI than those who are not experiencing probable mental distress?
- 4) What are the characteristics of distressed New Zealand high school students who access DMHI?

Participant age, gender, ethnicity, location of home (rural, small town or urban), neighbourhood deprivation grouping and school decile breakdowns are provided throughout to provide a detailed understanding of which groups are, and are not, accessing DMHI.

Some data reported here differ slightly from Youth19 data reported elsewhere due to differences in statistical methods and in the handling of missing data. For example, participants who had not answered three key demographic questions (sex, age and ethnicity) were excluded from the Youth19 Methods Report (Fleming, Peiris-John, Crengle, Archer, Sutcliffe, Lewycka, & Clark, 2020), whereas I have included these. Both approaches are reasonable and have been reviewed by Dr Sonia Lewycka (senior epidemiologist and biostatistician). This has resulted in the Youth19 Hauora Hinengaro *Emotional and Mental Health* Report (Fleming et al., 2020) recording slightly fewer adolescents with symptoms of depression than in this thesis, 1805 and 1820 respectively. These are very small differences which do not change the overall pattern of findings.

To contextualise my findings, I draw on analyses produced by the Youth19 research team which have been reproduced here with permission. Where I have done this, I have clearly indicated it by including the note “reproduced with permission from Youth19 researchers”.

Additional introductory, methodological and statistical information about the Youth19 survey are available in the Youth19 Introduction and Methods Report (Fleming, Peiris-John, et al., 2020), Emotional and Mental Health Report (Fleming, Tiatia-Seath, et al., 2020) and will be detailed in upcoming Youth19 publications (manuscripts in preparation).

5.1 Youth19 Results

The data in this section aims to familiarise the reader to the Youth19 sample prior to focusing on Youth19 DHR and DMHI in the following section. First, I report Youth19 school and participant response rates and characteristics, then provide demographic characteristics of participants by probable mental distress. In order to contextualise the sample from which I investigate DHR and DMHI, descriptive statistics for the overall Youth19 sample are provided in this section. Inferential statistics are beyond the scope of this thesis, and are detailed in the Youth19 Emotional Health Report (Fleming, Tiatia-Seath, et al., 2020).

5.1.1 School Response Rates and Demographic Characteristics

School response rates and characteristics are briefly summarised in Table 1 providing relevant context for my findings. Additional Youth19 school response rates and characteristics are available in the Youth19 Methods Report (Fleming et al., 2020).

As reported in Youth19 Methods Report (Fleming et al., 2020), 49 of the 86 invited schools participated, resulting in a school response rate of 56.98%. 35 invited mainstream secondary schools and two invited kura kaupapa Māori did not participate.

Twelve of the participating schools were located in Waikato (24.5%), 27 in Auckland (55.1%) and 10 in Tau Tokerau (20.4%); 45 (91.8%) were mainstream secondary schools and 4 were kura kaupapa Māori (8.2%); 41 (83.7%) were state funded, 6 (12.2%) were state-integrated (previously private schools that now receive state funding) and 2 (4.1%) were private schools.

Table 1

Youth19 school response rates and characteristics

	Eligible schools		Invited schools		Surveyed schools	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Total	169	-	86	-	49	-
Region						
Tau Tokerau	25	14.8%	10	11.6%	10	20.4%
Auckland	102	60.4%	53	61.6%	27	55.1%
Waikato	42	24.9%	23	26.7%	12	24.5%
School Type						
Mainstream Secondary	161	95.3%	80	93.0%	45	91.8%
Kura Kaupapa Māori	8	4.7%	6	7.0%	4	8.2%
Authority						
Private	20	11.8%	7	8.15	2	4.1%
State, integrated	28	16.6%	11	12.8%	6	12.2%
State, not integrated	121	71.6%	68	79.1%	41	83.7%
School Decile						
1	22	13.0%	9	10.5%	7	14.3%
2	22	13.0%	12	14.0%	5	10.2%
3	13	7.7%	7	8.1%	5	10.2%
4	21	12.4%	10	11.6%	7	14.3%

5	14	8.3%	1	8.1%	3	6.1%
6	11	6.5%	1	8.1%	3	6.1%
7	17	10.1%	11	12.8%	8	16.3%
8	9	5.3%	3	3.5%	1	2.0%
9	17	10.1%	7	8.1%	5	10.2%
10	18	10.7%	10	11.6%	4	8.2%
No decile information	5	3.0%	3	3.5%	1	2.0%

Note. Replicated with permission from Youth19 researchers.

5.1.2 Student Response Rates and Demographic Characteristics

This section reports the Youth19 student response rates and demographic characteristics of those who participated (Table 2). Additional details regarding the demographic characteristics of the Youth19 participants are available in the Youth19 Methods Report (Fleming et al., 2020).

As reported in table 2, 7721 students participated in Youth19 Survey, equating to 5.90% of all students from eligible schools and 18.25% of participating schools. Age, sex, and ethnicity are well represented. Participants who are 17 years and over are slightly under-represented in the Youth19 sample (18.1%) in contrast to the number of students who are 17 and over from all eligible schools (22.1%). Conversely, there is a slight over-representation of Asian students in the Youth19 sample (23.0%) in comparison to students from all eligible schools (17.1%). The majority of participants self-identified with one ethnicity ($n = 4462$, 57.8%), 36.3% ($n = 2804$) selected two and 5.9% ($n = 455$) selected 3 or more ethnicities (Fleming et al., 2020).

Students from schools of all deciles were represented in the Youth19 sample. The least students were from decile 8 schools ($n = 167$) and the most from decile 9 schools ($n = 1900$). Students attending decile 7 and 9 schools were slightly over-represented in the Youth19 sample in comparison to the total student population from all eligible schools.

Table 2

Youth19 participants response rates and characteristics

	Students from eligible schools		Students from participating schools		Students surveyed in Youth19	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Total	130,692		42,298		7,721	
Age						
13 and under	22,320	17.1%	7,203	17.0%	1,403	18.2%
14	26,763	20.5%	8,634	20.4%	1,745	22.6%
15	26,596	20.4%	8,727	20.6%	1,698	22.0%
16	26,189	20.0%	8,518	20.1%	1,474	19.1%
17 and over	28,824	22.1%	9,216	21.8%	1,401	18.1%
Sex						
Male	65,885	50.4%	34,715	48.8%	3472	45.0%
Female	64,807	49.6%	36,390	51.2%	4179	54.1%
Trans ^a						
Yes	-	-	-	-	78	1.0%
No	-	-	-	-	7542	97.7%
Unsure	-	-	-	-	48	0.6%
Region						
Auckland	97,415	74.5%	31,028	73.4%	5,545	71.8%

Waikato	24,074	18.4%	6,871	16.2%	1,248	16.2%
Tai Tokerau	9,203	7.0%	4,399	10.4%	928	12.0%
School Type						
Mainstream	129,765	99.3%	41,828	98.9%	7,374	95.5%
Secondary						
Kura Kaupapa Māori	927	0.7%	470	1.1%	347	4.5%
School Year						
Year 9	26,998	20.7%	8,638	20.4%	1,774	23.0%
Year 10	27,224	20.8%	8,875	21.0%	1,688	21.9%
Year 11	27,313	20.9%	8,904	21.1%	1,676	21.7%
Year 12	26,416	20.2%	8,628	20.4%	1,406	18.2%
Year 13	21,878	16.7%	7,223	17.1%	1,057	13.7%
Year 14	534	0.4%	28	0.1%	-	-
Year 15	329	0.2%	2	0.0%	-	-
School Decile						
1	11,760	9.0%	2,995	7.1%	469	6.1%
2	8,832	6.8%	2,506	5.9%	569	7.4%
3	9,175	7.0%	3,100	7.3%	512	6.6%
4	14,384	11.0%	4,787	11.3%	756	9.8%
5	10,294	7.9%	3,287	7.8%	545	7.1%

6	10,145	7.8%	2,121	5.0%	352	4.6%
7	17,084	13.1%	9,080	21.5%	1,589	20.6%
8	8,534	6.5%	707	1.7%	167	2.2%
9	22,554	17.3%	9,162	21.7%	1,900	24.6%
10	16,491	12.6%	4,410	10.4%	820	10.6%
No decile information	1,439	1.1%	143	0.3%	42	0.5%

Ethnicity						
Asian	22,297	17.1%	7,582	17.9%	1,776	23.0%
European	53,715	41.1%	17,182	40.6%	3,070	39.8%
Māori	24,898	19.1%	8,399	19.9%	1,528	19.8%
Pacific	19,854	15.2%	5,978	14.1%	945	12.2%
Other ^b	9,928	7.6%	3,157	7.5%	389	5.0%

Note. Student population data was retrieved from Education Counts.

Note. Replicated with permission from Youth19 researchers.

^a Population data for transgender adolescents was not available from Education Counts dataset.

^b Consists of Middle Eastern, Latin American, African, Other Ethnicities and ethnicity unknown.

5.1.3 Mental Distress among Youth19 participants

This current thesis explores DMHI access among adolescents experiencing mental distress. Thus, to provide necessary context, Youth19 participants' experiences of mental distress need to be described prior to reporting their DMHI access in *5.3 Current Thesis Results*.

This section reports demographic characteristics and experiences of probable mental distress of Youth19 participants. For transparency, I report demographic characteristic of those with symptoms of depression and those with symptoms of anxiety as separate groups.

My two main interest groups to answer my research questions are:

- 1) those with no mental distress, *not over RADS-SF or GAD2 cut-off*
- 2) those who have mental distress, *over RADS-SF and/or GAD2 cut-off*

Table 3

Demographic characteristics of adolescents by probable mental distress

	No probable distress		Probable distress		Probable symptoms of depression		Probable symptoms of anxiety	
	<i>n</i> (<i>N</i>)	Weighted % [95% CI]	<i>n</i> (<i>N</i>)	Weighted % [95% CI]	<i>n</i> (<i>N</i>)	Weighted % [95% CI]	<i>n</i> (<i>N</i>)	Weighted % [95% CI]
Total	3646 (7166)	49.77% [46.50, 53.03]	3658 (7468)	51.12% [47.78, 54.47]	1820 (7330)	25.71% [23.08, 28.34]	3172 (7304)	44.43% [41.43, 47.43]
Age								
≤13	704 (1277)	54.27% [50.00, 58.53]	591 (1344)	46.57% [42.19, 50.95]	286 (1324)	22.79% [19.37, 26.21]	511 (1297)	40.30% [35.96, 44.64]
14	849 (1593)	53.20% [49.14, 57.26]	781 (1677)	47.90% [43.75, 52.05]	401 (1646)	25.02% [21.87, 28.16]	664 (1624)	40.71% [37.13, 44.30]
15	772 (1570)	47.54% [42.99, 52.10]	837 (1645)	53.50% [48.95, 58.06]	433 (1607)	27.85% [23.91, 31.79]	723 (1608)	45.93% [42.22, 49.64]
16	660 (1392)	46.42% [40.56, 52.28]	750 (1429)	54.06% [48.28, 59.83]	368 (1409)	25.79% [22.35, 29.23]	650 (1412)	47.57% [41.12, 54.01]
≥17	661 (1334)	47.59% [42.99, 52.18]	699 (1373)	53.35% [48.88, 57.82]	332 (1344)	26.70% [22.80, 30.60]	624 (1363)	47.66% [43.29, 52.03]
Gender								
Female	1676 (3935)	41.77% [38.26, 45.28]	2343 (4097)	59.04% [55.49, 62.59]	1284 (4017)	32.53% [29.74, 35.32]	2027 (4015)	51.32% [47.77, 54.86]

Male	1967 (3219)	60.53% [57.30, 63.77]	1302 (3354)	40.37% [37.00, 43.74]	532 (3301)	16.58% [15.05, 18.11]	1136 (3272)	35.19% [32.04, 38.34]
Trans								
No	3627 (7057)	50.30% [47.05, 53.55]	3558 (7348)	50.55% [47.22, 53.87]	1758 (7218)	25.19% [22.63, 27.75]	3087 (7187)	43.96% [40.97, 46.94]
Yes	11 (65)	16.50% [8.48, 24.51]	59 (71)	84.66% [77.04, 92.28]	36 (66)	61.69% [44.91, 78.48]	51 (70)	72.51% [60.40, 84.63]
Unsure	6 (40)	13.90% [2.13, 25.67]	38 (44)	87.39% [76.73, 98.06]	25 (42)	56.79% [43.02, 70.55]	32 (42)	78.83% [67.69, 89.98]
Ethnicity								
Asian	874 (1697)	50.35% [45.47, 55.23]	847 (1747)	50.35% [45.33, 55.38]	440 (1725)	26.04% [22.58, 29.50]	722 (1719)	43.42% [38.75, 48.09]
European	1646 (2956)	54.38% [50.83, 57.92]	1337 (3029)	46.08% [42.55, 49.62]	639 (2995)	22.77% [19.65, 25.90]	1206 (2990)	41.46% [38.17, 44.74]
Māori	608 (1338)	44.67% [39.91, 49.43]	773 (1432)	56.60% [51.87, 61.33]	418 (1394)	31.41% [27.14, 35.69]	658 (1376)	48.37% [44.46, 52.27]
Pacific	352 (826)	41.14% [36.78, 45.51]	504 (881)	60.26% [55.75, 64.78]	222 (852)	26.82% [22.05, 31.59]	421 (855)	50.24% [46.68, 53.80]
Other	162 (337)	46.78% [41.86, 51.71]	189 (367)	55.08% [49.93, 60.23]	98 (352)	27.01% [22.09, 31.93]	157 (352)	45.93% [41.33, 50.53]

Locale								
Urban	2489	49.43%	2504	51.49%	1241	25.88%	2164	44.86%
	(4897)	[45.47, 53.39]	(5085)	[47.41, 55.57]	(4997)	[22.51, 29.25]	(4985)	[41.18, 48.54]
Small town	249	49.68%	263	50.83%	143	27.60%	231	43.78%
	(506)	[43.70, 55.67]	(534)	[44.91, 56.75]	(524)	[22.16, 33.04]	(516)	[38.25, 49.31]
Rural	574	54.69%	486	46.12%	248	22.82%	418	39.57%
	(1043)	[50.60, 58.78]	(1091)	[42.15, 50.10]	(1072)	[19.88, 25.76]	(1062)	[35.98, 43.16]
New Zealand Deprivation								
Low	1156	56.72%	888	43.87%	410	20.18%	780	38.50%
	(2021)	[53.28, 60.15]	(2084)	[40.34, 47.41]	(2055)	[17.70, 22.66]	(2050)	[34.73, 42.28]
Medium	1406	50.54%	1305	50.20%	679	26.62%	1142	44.17%
	(2669)	[46.40, 54.68]	(2758)	[46.12, 54.27]	(2715)	[22.59, 30.65]	(2712)	[40.30, 48.04]
High	750	42.29%	1059	58.95%	542	29.95%	890	50.03%
	(1755)	[38.17, 46.42]	(1867)	[54.78, 63.13]	(1822)	[26.23, 33.68]	(1800)	[46.69, 53.37]
School Decile								
Low	543	40.55%	832	60.74%	405	29.61%	711	51.40%
	(1323)	[36.42, 44.69]	(1422)	[56.46, 65.03]	(1373)	[25.61, 33.62]	(1372)	[48.41, 54.39]
Medium	1545	49.81%	1516	51.14%	768	26.25%	1311	44.59%
	(3001)	[45.59, 54.03]	(3141)	[46.99, 55.28]	(3081)	[22.50, 29.99]	(3061)	[40.13, 49.06]
High	1536	54.03%	1290	46.49%	633	23.06%	1137	41.03%
	(2801)	[49.27, 58.79]	(2863)	[41.65, 51.33]	(2835)	[18.64, 27.49]	(2829)	[36.77, 45.28]

Note. Replicated with permission from Youth19 researchers.

5.2 Current Study Results

This thesis aims to describe who accessed the DMHI that were provided at the end of the Youth19 Rangatahi Smart Survey, with a particular focus whether the DMHI reached those experiencing emotional distress. As shown in Figure 7, participants had to navigate through a four stage to access the DMHI. As such, to address this aim and answer the four research questions I have posed, it is necessary to mirror the participant journey to DMHI.



Figure 7. Participant journey to access DMHI

5.2.1 Adolescents who opted-in to DHR

First, I focus on describing the participants who, after completing the Youth19 survey ($N = 7721$), chose to opt-in to receive the DHR ($n = 1720$, 22.81% [18.56, 27.05]) by providing their email address or mobile phone number. The data in this section addresses research question 1 by describing the demographic characteristics and distress of participants who did and did not opt-in to receive the Youth19 DHR. Table 4 reports the overall number of Youth19 participants within demographic groups and who reported experiencing probable distress (N), as well as the number (n) and estimated prevalence (weighted %) of those participants who did and did not opt-in to receive DHR. Chi-squared tests examine for significant differences between opt-in status and demographic group, and opt-in status and the presence or absence of probable mental distress.

Participant demographics

Demographic characteristics were consistently related to whether or not participants chose to opt-in to receive DHR. See Table 4 for contingencies. In particular, there was a significant relationship between age band and opt-in status ($\chi^2(4, N = 7721) = 46.95, p < .001, r = .08$), whereby older participants are more likely to opt-in than younger participants. For example, 17-year-olds were 1.53 times more likely to opt-in (27.57% [22.16, 32.97], $n = 381$, N

= 1401) than 13-year-olds (17.95% [12.74, 23.17], $n = 243$, $N = 1403$). Participant gender was significantly related to opt-in status, ($\chi^2(1, N = 7651) = 15.89$, $p < .001$, $r = .05$) with female participants 1.20 times more likely to opt-in (24.68% [20.22, 29.13], $n = 1008$, $N = 4179$) than male participants (20.61% [15.83, 25.38], $n = 705$, $N = 3472$). Ethnicity also demonstrated a significant relationship with opt-in status ($\chi^2(4, N = 7708) = 55.51$, $p < .001$, $r = .09$). For instance, Pacific participants were 1.45 times more likely to opt-in (28.64% [22.48, 34.80], $n = 945$, $N = 4179$) than European participants (19.77% [14.31, 25.23], $n = 570$, $N = 3070$). See Table 4 for all contingencies.

Community Context

The context in which young people live was also related to whether or not participants chose to opt-in to receive DHR. There was a significant relationship between locale and opt-in status ($\chi^2(2, N = 6889) = 11.32$, $p = .003$, $r = .04$); where participants living in urban environments were 1.25 times more likely to opt-in (23.25% [18.73, 27.76], $n = 1175$, $N = 5220$) than both participants living in rural environments (18.54% [12.73, 24.35], $n = 205$, $N = 1113$) and participants living in small towns (18.65% [14.92, 22.39], $n = 106$, $N = 556$). The New Zealand deprivation index was also related to opt-in status ($\chi^2(2, N = 6888) = 36.63$, $p < .001$, $r = .07$), with participants living in high deprivation neighbourhoods were 1.32 times more likely to opt-in (25.08% [20.42, 29.73], $n = 507$, $N = 1969$) than participants living in low deprivation neighbourhoods (18.93% [14.23, 23.64], $n = 379$, $N = 2110$). Lastly, school decile was related to opt-in status ($\chi^2(2, N = 7679) = 78.93$, $p < .001$, $r = .10$) such that participants attending a low decile school were 1.54 times more likely to opt-in (28.10% [21.99, 34.21], $n = 458$, $N = 1550$) than participants attending a high decile school (18.20% [14.73, 21.67], $n = 518$, $N = 2887$).

Probable Mental Distress

Most notably for this current thesis, chi-squared test revealed significant relationship between distress and opt-in status, $\chi^2(1, N = 7304) = 45.22$, $p < .001$, $r = .08$. Participants experiencing distress were 1.30 times more likely to opt-in (26.73% [21.87, 31.59], $n = 956$, $N = 3658$) than participants not experiencing distress (20.15% [15.89, 24.41], $n = 712$, $N = 3646$).

Table 4

Demographic characteristics of adolescents by HWR opt-in status.

	<i>N</i>	Did opt-in		Did not opt-in	
		<i>n</i>	Weighted % [95% CI]	<i>n</i>	Weighted % [95% CI]
Distress					
No probable distress	3646	712	20.15% [15.89, 24.41]	2934	79.85% [75.59, 84.11]
Probable distress	3658	956	26.73% [21.87, 31.59]	2702	73.27% [68.41, 78.13]
Age					
≤13	1403	243	17.95% [12.74, 23.17]	1160	82.05% [76.83, 87.26]
14	1745	390	22.01% [18.17, 25.85]	1355	77.99% [74.15, 81.83]
15	1698	346	20.90% [17.05, 24.74]	1352	79.10% [75.26, 82.95]
16	1474	360	25.89% [20.93, 30.85]	1114	74.11% [69.15, 79.07]
≥17	1401	381	27.57% [22.16, 32.97]	1020	72.43% [67.09, 77.84]
Sex					
Female	4179	1008	24.68% [20.22, 29.13]	3171	75.32% [70.87, 79.78]
Male	3472	705	20.61% [15.83, 25.38]	2767	79.39% [74.62, 84.17]
Ethnicity					
Asian	1776	436	25.56% [20.95, 30.17]	1340	74.44% [69.83, 79.05]

European	3070	570	19.77% [14.31, 25.23]	2500	80.23% [74.77, 85.69]
Māori	1528	359	22.82% [19.03, 26.61]	1169	77.18% [73.39, 80.97]
Pacific	945	273	28.64% [22.48, 34.80]	672	71.36% [65.20, 77.52]
Other	389	80	18.54% [12.57, 24.51]	309	81.46% [75.49, 87.43]
Locale					
Urban	5220	1175	23.25% [18.73, 27.76]	4045	76.75% [72.24, 81.27]
Small town	556	106	18.65% [14.92, 22.39]	450	81.35% [77.61, 85.08]
Rural	1113	205	18.54% [12.73, 24.35]	908	81.46% [75.65, 87.27]
New Zealand Deprivation					
Low deprivation	2110	379	18.93% [14.23, 23.64]	1731	81.07% [76.36, 85.77]
Medium deprivation	2809	600	22.71% [18.32, 27.11]	2209	77.29% [72.89, 81.68]
High deprivation	1969	507	25.08% [20.42, 29.73]	1462	74.92% [70.27, 79.58]
School Decile					
Low	1550	458	28.10% [21.99, 34.21]	1092	71.90% [65.79, 78.01]
Medium	3242	734	24.20% [16.33, 32.07]	2508	75.80% [67.93, 83.67]
High	2887	518	18.20% [14.73, 21.67]	2369	81.80% [78.33, 85.27]

5.2.2 Adolescents who accessed DHR

Second, I focus on describing the participants who upon opting-in ($N = 1720$), chose to access the DHR ($n = 187$, 10.40% [7.92, 12.89]) by clicking on the hyperlink that was sent to them through email or text. Alongside 5.3.1 *Adolescents who opted-in to DHR*, the data in this section addresses research question 1 by describing the demographic characteristics and distress of participants who did and did not access the Youth19 DHR. Table 5 reports the overall number of Youth19 participants within demographic groups and who reported experiencing probable distress (N), as well as the number (n) and estimated prevalence (weighted %) of those participants who did and did not access DHR. Chi-squared tests examine for significant differences between access status and demographic group, and access status and the presence or absence of probable mental distress.

Participant Demographics

Demographic characteristics were inconsistently related to whether or not participants chose to opt-in to receive DHR. See Table 5 for contingencies. There was no evidence of a relationship between age band and access status ($\chi^2(4, N = 1720) = 1.59, p = .809, r = .08$). In contrast, gender was significantly related to access status, ($\chi^2(1, N = 1713) = 7.67, p = .006, r = .07$), with female participants 1.71 times more likely to access DHR (12.42% [9.66, 15.17], $n = 127, N = 1008$) than male participants (7.25% [3.34, 11.17] $n = 59, N = 705$). Ethnicity also demonstrated a significant relationship with access status ($\chi^2(4, N = 1718) = 13.39, p = .010, r = .09$). For instance, European participants were 2.10 times more likely to access DHR (12.85% [9.12, 16.59], $n = 71, N = 570$) than Pacific participants (6.11% [2.90, 9.32] $n = 18, N = 273$). See Table 5 for all contingencies.

Community Context

The context in which young people live was also inconsistently related to whether or not participants accessed DHR. There was no evidence of a relationship between locale and access status ($\chi^2(2, N = 1486) = 1.75, p = .417$). However, the New Zealand deprivation index was related to access status ($\chi^2(2, N = 1486) = 11.28, p = .004, r = .09$), with participants living in medium deprivation neighbourhoods were 2.66 times more likely to access DHR (12.52% [9.24, 15.80], $n = 75, N = 600$) than participants living in high deprivation neighbourhoods (7.01% [4.61, 9.41] $n = 39, N = 507$). Lastly, school decile was related to DHR access status ($\chi^2(2, N = 1710) = 35.44, p < .001, r = .14$) such that participants attending a high decile school were 2.67

times more likely to access DHR (17.67% [14.90, 20.45], $n = 91$, $N = 518$) than participants attending a low decile school (6.62% [4.38, 8.86] $n = 33$, $N = 458$).

Probable Mental Distress

Most notably for this current thesis, chi-squared test revealed significant relationship between distress and DHR access status ($\chi^2(1, N = 1668) = 4.19$, $p = .041$, $r = .05$) such that participants experiencing distress were 1.34 times more likely to opt-in (11.67% [8.93, 14.41], $n = 116$, $N = 956$) than participants not experiencing distress (8.69% [5.70, 11.68] $n = 64$, $N = 712$).

Table 5

Demographic characteristics of adolescents by DHR access status.

	<i>N</i>	Did access		Did not access	
		<i>n</i>	Weighted % [95% CI]	<i>n</i>	Weighted % [95% CI]
Distress					
No probable distress	712	64	8.69% [5.70, 11.68]	648	91.31% [88.32, 94.30]
Probable distress	956	116	11.67% [8.93, 14.41]	840	88.33% [85.59, 91.07]
Age					
≤13	243	28	9.38% [5.16, 13.59]	215	90.62% [86.41, 94.84]
14	390	41	12.38% [6.98, 17.78]	349	87.62% [82.22, 93.02]
15	346	32	7.64% [3.52, 11.75]	314	92.36% [88.25, 96.48]
16	360	43	11.20% [8.04, 14.36]	317	88.80% [85.64, 91.96]
≥17	381	43	10.83% [7.86, 13.80]	338	89.17% [86.20, 92.14]

Sex						
Female	1008	127	12.42% [9.66, 15.17]	881	87.58% [84.83, 90.34]	
Male	705	59	7.25% [3.34, 11.17]	646	92.75% [88.83, 96.66]	
Ethnicity						
Asian	436	60	12.24% [7.81, 16.68]	376	87.76% [83.32, 92.19]	
European	570	71	12.85% [9.12, 16.59]	499	87.15% [83.41, 90.88]	
Māori	359	29	6.81% [3.38, 10.24]	330	93.19% [89.76, 96.62]	
Pacific	273	18	6.11% [2.90, 9.32]	255	93.89% [90.68, 97.10]	
Other	80	8	8.75% [1.36, 16.14]	72	91.25% [83.86, 98.64]	
Locale						
Urban	1175	140	11.11% [8.52, 13.70]	1035	88.89% [86.30, 91.48]	
Small town	106	9	7.09% [1.35, 12.84]	97	92.91% [87.16, 98.65]	
Rural	205	20	9.22% [4.38, 14.05]	185	90.78% [85.95, 95.62]	
New Zealand Deprivation						
Low deprivation	379	55	12.19% [7.00, 17.38]	324	87.81% [82.62, 93.00]	
Medium deprivation	600	75	12.52% [9.24, 15.80]	525	87.48% [84.20, 90.76]	
High deprivation	507	39	7.01% [4.61, 9.41]	468	92.99% [90.59, 95.39]	

School Decile					
Low	458	33	6.62% [4.38, 8.86]	425	93.38% [91.14, 95.62]
Medium	734	61	7.84% [5.65, 10.02]	673	92.16% [89.98, 94.35]
High	518	91	17.67% [14.90, 20.45]	427	82.33% [79.55, 85.10]

5.2.3 Adolescents who accessed DMHI

Last, I focus on describing the participants who upon accessing the DHR ($N = 187$), went on to access the DMHI ($n = 7$) by clicking on the “feeling down” navigation tab.

This section addresses research question 3 and 4 by describing the demographic characteristics and distress of participants who did and did not access the Youth19 DMHI. Due to insufficient cell sizes, statistical analyses would be inappropriate, and so participant DMHI access are simply described.

Seven participants, 0.39% (0.07 - 0.70%) of those who opted-in, accessed the DMHI. Of these seven participants, five were experiencing mental distress, two were not. Among the five participants who were experiencing mental distress and accessed the DMHI: all were cisgender-female; one was 13 years old or under, three were 14 years old, and one was 15 years old; two were Asian, one was European and one was Māori. Of the two participants who were not experiencing mental distress and accessed the DMHI: one was male, one was female; both were cis-gender; one was 16 years old and one was 17 or older; both were European.

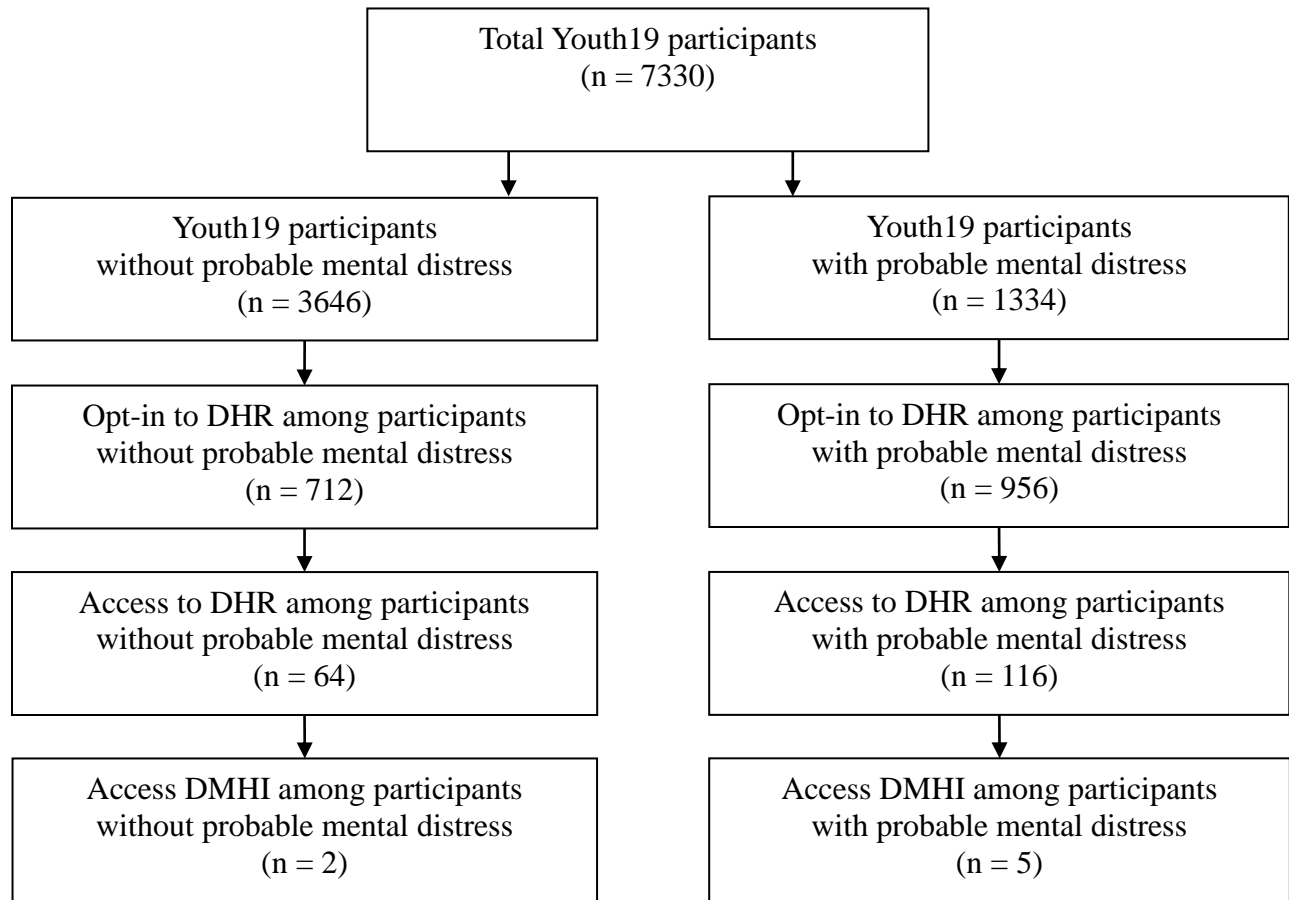


Figure 8. Flow diagram of participant journey from Youth19 Smart Survey to DMHI access

5.4 Conclusion

Of the participants who completed the Youth19 survey ($n = 7721$), slightly over one in five chose to opt-in to receive DHR ($n = 1720$, 22.81% [18.56, 27.05]). Of those who did opt-in to receive the DHR, 10.40% ($n = 187$, 10.40% [7.92, 12.89]) went on to access the DHR using the hyperlink emailed or text to them, and only seven (0.39% [0.07 - 0.70]) accessed the DMHI (Figure 8).

Demographic characteristics consistently related to whether or not participants opted-in to receive DHR, whereas, only some were related to whether or not participants accessed the

DHR. These results reveal some interesting findings which, in the following chapter, will be situated within the literature and discussed.

Importantly, to address the aim of this current these, I will discuss the large attrition (Figure 9), the factors that may have shaped these findings, and the how these findings can inform digital help provision in research, clinical and real-world settings.

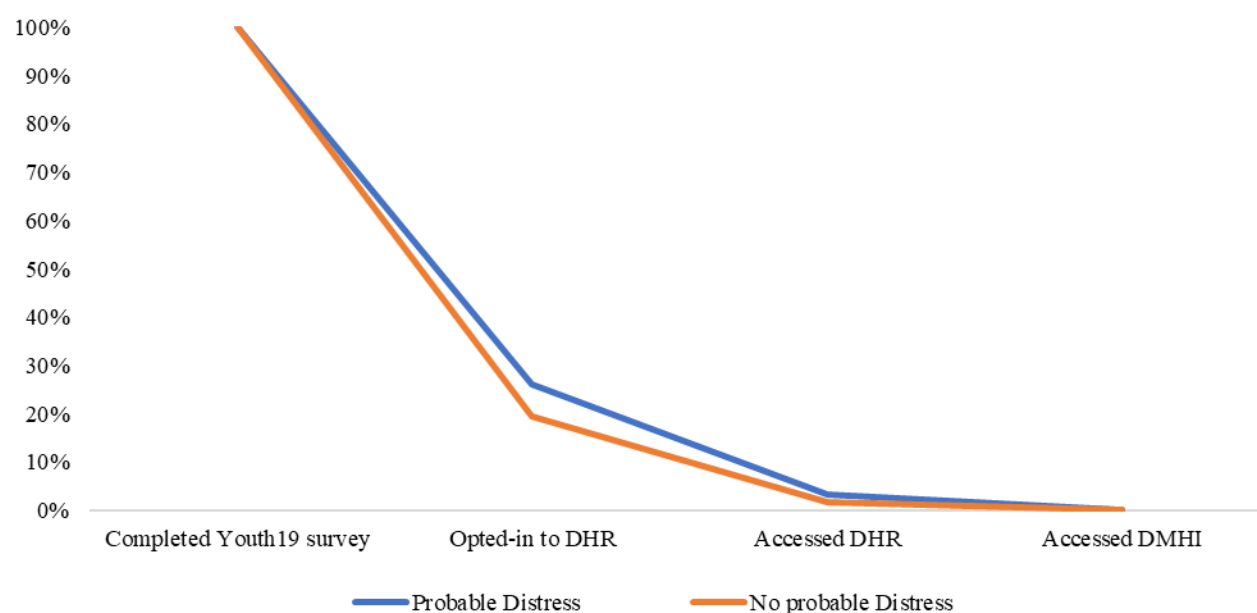


Figure 9. Percentage of participants to complete Youth19 Smart Survey, opt-in to DHR, access DHR, and access DMHI by probable distress

Chapter 6: Discussion

In this thesis, I draw upon Youth19 Smart Survey data to explore adolescent uptake of DMHI in a real-world setting, with a particular focus on those experiencing probable mental distress. I first describe and conduct analyses to ascertain whether participants with probable mental distress and participants from specific demographics groups were more likely to opt-in and access DHR, in order to then describe the participants who then went on to access DMHI. In this chapter, I begin by discussing the main research findings and situating them within previous digital mental health research. As part of this discussion, I focus on understanding the participant journey from the Youth19 survey to the Youth19 DHR to the DMHI. From here, I consider DHR opt-in, DHR access and DMHI access findings in the context of the literature, before the chapter moves into a broader discussion of the findings and their implications for policy, research and clinical practice. I then conclude by summarising the strengths and limitations of the research and possible future research directions.

6.1 Statement of Main Findings

Among 7,721 New Zealand adolescents, I found a moderate level of interest in receiving DHR across diverse adolescents; one in five (22%) adolescents opted-in at the end of the Youth19 Smart Survey to receive a hyperlink which contained a selection of health-related resources relevant to the survey contents. There was, however, a large reduction between opt-in and access to DHR, and another large reduction in uptake between access to DHR and access to DMHI. As a consequence of these reductions, among the Youth19 survey participants who chose to opt-in, less than 0.5% accessed the Youth19 DMHI. Taken together, these results suggest a moderate level of interest in DHR among adolescents but also significant barriers between being interested in and going on to access DHR, and then going on to access DMHI.

Crucially, participants experiencing probable mental distress were more likely to both opt-in and access DHR than participants who were not experiencing probable mental distress. Some demographic characteristics were also related to DHR opt-in and access, as discussed below. However, all effect sizes were small (Cohen, 1962). Interestingly, this may suggest that the Smart Survey concept and resources appealed more to specific demographic groups and, given the small differences in DHR opt-in and access between groups, were also somewhat

appealing to diverse groups. However, only few adolescents use DHR as a route to access DMHI.

The results of this research raise important questions regarding real-world access to DMHI among adolescents, how DMHI are offered, and the challenges of digital help provision. I will consider these questions in this chapter.

6.2 Discussion of Findings

This research used an innovative and novel method to offer DHR and DMHI to adolescents and measure their uptake. Given the novel and exploratory nature of this research, little empirical peer-reviewed research is available for comparison. Grey literature has been used, where appropriate, to situate these findings in the current literature. I then make sense of these findings by discussing the participants' journey through DHR resource opt-in and access, en-route to DMHI access.

6.2.1 Adolescents who opted-in to DHR

As participants are not actively engaging with the DHR at this stage, opting-in to receive DHR does not constitute 'uptake', as uptake typically requires active engagement with a resource (Fleming et al., 2018). Instead, DHR opt-in may indicate a willingness or openness to receive help options (Fleming, personal communication, August 4, 2020).

Over 22% of participants opted-in to receive DHR following the Youth19 survey, slightly higher than the 15% high school students who report previously using the internet for health-based information (Utter et al., 2017), but substantially smaller than the 45 to 51% of Australian adolescents who report an interest in using the internet to information in the Youth Mental Health Report (Hall et al., 2019). Taken together, this suggests that opt-in to DHR is capturing more than just passive *intent* but rather a *willingness* to seek, use, or receive DHR.

Probable Mental Distress

In the current study, opt-in among those with probable mental distress was significantly greater than those without, 26.73% and 20.15% respectively, suggesting that DHR – when offered in this way – may appeal more to participants with probable distress. This finding is consistent with previous research that adolescents experiencing probable distress report more interest in seeking online health-based information than their non-distressed counterparts (Hall et

al., 2019; Utter et al., 2017). This may be due to the increased privacy or decreased stigma experienced when accessing health information online (for discussion see Gulliver et al., 2010; Sweeney et al., 2019).

Participant Demographics

Opt-in to DHR was higher among older participants, female participants, and Pacific participants in the current study. Consistent with the previous literature, older adolescents and females report using the internet to access health-based information more often (Burns et al., 2010; Utter et al., 2017). The limited previous evidence among New Zealand adolescents suggests that there are no ethnicity differences in internet use to seek health information (Utter et al., 2017), as such, it is unexpected that this study found that Pacific adolescents were most likely to opt-in to receiving Youth19 DHR.

Community Context

Opt-in to DHR was related to locale, neighbourhood deprivation and school decile, whereby participants living in urban or high deprivation neighbourhood, or those attending low decile schools were more likely to opt-in. Given the novelty of the Smart Survey method, and the exploratory nature of this research there are no studies to my knowledge that describe similar methods to which to compare. Given the relative lack of access to resources, DHR could be a promising option for people living rurally; however, if rural adolescents are the target population, delivery may need to be modified to appeal more to this group. Interestingly, and in contrast with the current finding, previous research reports higher internet use for finding health information among New Zealand adolescents who live in areas of low deprivation or attend high decile schools. Again, this could support the suggestion that self-reported digital help-seeking and opting-in to receive DHR are measuring two different constructs. Nonetheless, this is a particularly interesting finding that suggests the Smart Survey approach, and DHR in general, may be an appropriate method of distributing health information to adolescents from both high deprivation and low decile schools. This finding highlights a significant gap in the existing literature and opportunities for future research to investigate how to maximise upon the slightly higher interest in DHR found in high deprivation neighbourhoods and low deprivation schools.

6.2.2 Adolescents who accessed DHR

Next, I move on to consider the participants who, after opting in to receive the DHR, went on to access the DHR. Of the participants who chose to opt-in to receive DHR following the Youth19 survey, approximately 10% clicked on the hyperlink to access the DHR. Again, drawing on Utter et al., (2017) findings, 15% of New Zealand adolescents report previously using the internet for health-based information, suggesting that adolescents are more likely to access the internet for health information autonomously than choose to access the Youth19 DHR. Based on the current findings, it is unclear whether those who accessed the Youth19 DHR are the same participants who seek digital help through other methods, or whether they are a group that would otherwise not seek help. Further investigations could help ascertain whether DHR – when delivered in this way – reach participants who would otherwise not seek health information autonomously.

The proportion of participants to report that they access health-related information on the internet in Utter et al., (2017) findings is, intriguingly, more consistent with those that opt-in for DHR in the current study, opposed to accessing DHR. As previously discussed, this suggests that the opt-in measure in the current study is reporting more than *passive interest* in resources but reporting those who are *actively interested* – or may already be autonomously using – digital resources for health information.

Probable Mental Distress

Similar to the opt-in findings, DHR access was higher among those with probable mental distress than those without probable mental distress, 11.67% and 8.69% respectively. In previous studies, adolescents who experience distress report accessing DHR at substantially higher rates than those seen in the current study (Burns et al., 2010; Ellis et al., 2004). However, it is important to note that the current study reports adolescent access to the specific DHR that were sent to them; it is possible that they did not use the Youth19 DHR but that they do use the internet, or got prompted to use the internet, to access DHR autonomously via other methods.

Consistent with the current findings, Utter et al., (2017) found reports of previously using the internet to find health-related information was positively associated with symptoms of depression among New Zealand high school students.

Participant Demographics

DHR access was higher among female participants and European participants in the current study. Female participants' DHR access is consistent with the literature and with DHR opt-in (Burns et al., 2010; Hall et al., 2019; Rickwood et al., 2016; Utter et al., 2017). A particularly interesting and unexpected findings was that Pacific adolescents appear more likely to opt-in than European adolescents, but the reverse was evident at access. That is *willingness* to seek, use, or receive digital health resources was high, but *access* of these digital health resources was low. Mesch (2016) found similar pattern in a survey conducted in Israel, whereby the ethnic minority were more likely to show interest in using the internet for health-related information, but the ethnic majority were more likely to access these resources. This is an intriguing finding that has emerged from this exploratory study and should be investigated in future research.

Again, interestingly, DHR access was similar across all age groups, again a shift away from the higher DHR opt-in seen among older adolescents. The lack of statistical significance here is interesting and suggests that once adolescents have easy access to DHR in their text or email inbox, it is equally likely to be engaged with by all ages.

Community Context

DHR access was higher among participants living in medium deprivation neighbourhoods, and participants attending high decile schools in the current study. Again, this is of great interest given the higher opt-in among participants living in high deprivation neighbourhoods and attending low decile schools. This finding, briefly discussed in 6.4 *Implications*, may be indicating the presence of a digital divide, and should be explored further to ensure that digital resources are not contribute to existing inequalities.

6.2.3 Adolescents who accessed DMHI

DMHI are an emerging and attractive option for providing useful and scaleable resources using technology that adolescents generally find acceptable and are already engaging with (Ebert et al., 2015; Grist et al., 2019; Hall et al., 2019; Hollis et al., 2015; Pretorius et al., 2019). Importantly, they are thought to be a promising method for minimising barriers to mental healthcare and reaching adolescents with higher levels of distress or those belonging to groups with inequitable access to mental health resources (Christensen & Hickie, 2010; Olf, 2015). In the current study, participants who had accessed DHR ($n = 64$) could access DMHI by clicking on the “feeling down” navigation tab.

Of participants who did opt-in to receive the DHR, only seven accessed the DMHI. Consistent with previous literature, the current findings demonstrate poor DMHI uptake among adolescents in real-world settings (Baumel et al., 2019; Fleming et al., 2018) and the need to increase research attention on the implementation of DMHI (Fleming et al., 2016; Liverpool et al., 2020; Scholten & Granic, 2019).

There are, however, many unknowns. Seven participants accessed the Youth19 DMHI. However, it is possible that more participants accessed DMHI autonomously, for example by accessing health information through internet searches. Additionally, due to a lack of follow-up, it is unclear the benefit the seven individuals received by accessing the DMHI. For example, participants who did access DMHI may have received great benefit, or participants who saw but did not access DMHI may have received benefit (e.g. knowing they were accessible if required, or prompting their own, autonomous internet searches). This current thesis, therefore, reveals low real-world DMHI access when delivered using the current method but does not imply anything about the efficacy or benefit of these resources or Smart Survey approach.

6.3 Implications

Digital mental health is an emerging area of research and practice, it is therefore essential to discuss the implications of the current findings and what they indicate about how DMHI are provided in research, clinical and community settings. These findings will have been shaped by *how* and *what* DMHI were offered in the current study; discussing these factors helps to decipher what affects adolescents' decisions to engage with DMHI and indicates opportunities to improve adolescent access to DMHI. The Youth19 survey, opt-in and access to DHR will continue to be considered as this was the only route for participants to gain access to DMHI in this study.

6.3.1 Factors Shaping Findings

A primary aim of Smart Survey research, in addition to data collection, is to distribute relevant digital resources to participants (Fleming, Peiris-John, et al., 2020; Peiris-John et al., 2020); however, the participants' personal experience of the survey and opt-in process may have shaped the current findings. Participants may have chosen to opt-in, or not, for a number of reasons beyond whether or not they wanted access to the DHR and DMHI. For example, opt-in may have been influenced by participants' experience of the survey rather than their desire to use

digital resources. Participants, for example, may be tired or lacking in motivation after focusing on the Youth19 survey and a digital device for, on average, 46 minutes (for discussion see Hoerger, 2010); participants may have had different experiences of completing the survey questions depending on their personal wellbeing, the sensitivity of the information they disclosed, and their ability to easily comprehend the questions. These variables may have affected individuals', or groups', motivation to engage in the survey and in the opt-in process.

Immediately after contemplating their health and mental health in the Youth19 survey, participants were offered the DHR with the intention of providing appropriate support at a possibly distressing time. However, requesting contact details soon after the survey may have raised privacy concerns for participants and may have reduced participants' willingness to opt-in. Privacy is a common concern for adolescents seeking mental health information online (Gulliver et al., 2010; Kretzschmar et al., 2019) and reassuring participants that survey answers would be anonymous and that contact details would be stored separately may not have been sufficient. Improving digital privacy is important, but in addition to this, we must be able to effectively *assure* participants and adolescents of their privacy. The therapeutic alliance is an important component of assuring privacy when in-person but translating this to a digital environment remains challenging (Henson et al., 2019; Wu et al., 2017).

The way that the resources are offered, designed, described and titled may also influence participant engagement (Baumel & Yom-Tov, 2018; Fleming et al., 2016, 2019; Liverpool et al., 2020). The navigation tab "feeling down" used to access DMHI, for example, may not capture the type of resources that are included within that navigation tab and may not appeal to all adolescents. Modifying how resources are provided depending on the users' preferences (e.g. design, interface and communication) may enable scaled, generic resources to be tailored to specific individuals or groups. These elements may have shaped the current findings; however, in-depth analysis of their effects is beyond the scope of the current study. Future research and development of digital resources should draw on the expertise of teachers, programmers, artists, psychologist and adolescents themselves to ensure that the design of DMHI facilitates engagement (Scholten & Granic, 2019).

In addition to how DMHI are offered, adolescents also have different preferences for the type of DMHI they use (Fleming et al., 2019). Providing a selection or 'hub' of DHR, as per the Youth19 resources (Fleming, Peiris-John, et al., 2020; Peiris-John et al., 2020), has the potential

to offer a wide variety of options to suit users' needs and increase user autonomy by providing options while still being scaleable (Lattie et al., 2016; Peiris-John et al., 2020). However, the attrition rate in the current study suggests that, even with a diverse selection of options, there are still challenges in appealing to and engaging large numbers.

Beyond personal preferences there may be structural barriers that shaped these findings. For example, one interesting finding in the current study was that participants attending low decile schools were most likely to opt-in to receive DHR, but participants attending high decile schools were most likely to access DHR. Similar patterns were also evident between Pacific and European adolescents, the neighbourhood deprivation index, and locale categories. Similar patterns have been documented in the online health help-seeking literature suggesting that, despite digital resources addressing some of the barriers to in-person healthcare (addressed in 2.3.2 in regard to mental health), some barriers – such as the digital divide – persist (Lustria et al., 2011; Utter et al., 2017).

6.3.2 Digital Help Provision

How resources are offered and what resources are offered may shape adolescent DHR and DMHI access, but overall patterns of engagement are also revealing. Following the Youth19 survey, participants were required to take three actions to access the DMHI: opt-in DHR, access DHR, then access DMHI. Attrition was high at each of these stages in the current study. First, this overall pattern may indicate that each action that the participant is required to take may come with its own barriers. For example, the digital divide may not be a barrier at opt-in as handheld devices were provided for Youth19 survey completion, but the digital divide may be a barrier at the DHR or DMHI access stage; whereas, self-stigma may be a barrier at all stages. This, too, could be the case in when offering adolescents DMHI in community and clinical settings. Second, and consistent with previous literature, this attrition suggests low real-world engagement to digital resources (Baumel et al., 2019; Fleming et al., 2018). To effectively implement DMHI, real-world uptake should be an indicator of DMHI performance that is prioritised equally to that of cost and efficacy (Fleming et al., 2016; Lattie et al., 2016; Muñoz et al., 2016).

To harness the potential of DMHI, increasing engagement is important (Christensen et al., 2009; Donkin et al., 2011); however, it is essential that engagement is increased in a manner that does not exacerbate disparities in mental health outcomes and access to mental healthcare in

New Zealand adolescents. The current finding revealed that there were differences between groups who opted-in and accessed DHR, but these differences were small. On one hand, this could be interpreted as promising as it suggests moderate interest in DHR across diverse groups. On the other hand, the size of these effects could suggest that they were somewhat suitable for the masses, rather than being tailored to suit the needs or preferences of a target population, for example, adolescents who experience probable mental distress (Davidson et al., 2019; Muñoz et al., 2019). The current thesis explores one specific pathway to access DMHI, but to harness the potential of these resources as an equitable help option, future research needs keep the target audience, their needs and preferences at the fore while developing strong pathways to access DMHI.

These findings also prompt us to question participants' uptake of the mental health help options that, anecdotally, human research ethics committees typically recommend researchers include at the end of surveys. Based on the current findings, engagement with these post-survey help options may be poor and may not be used by many participants who experience probable mental distress. Considering more effective alternatives to this practice is challenging, but necessary.

6.4 Strengths of the current study

In terms of the Youth19 project, within which this specific study falls, the strengths are the diverse and representative sample, and the community consultation that was undertaken when developing the Youth19 survey and the Smart Survey approach (Fleming, Peiris-John, et al., 2020; Peiris-John et al., 2020).

The strengths of this current thesis are that it, to my knowledge, is the first study to explore the uptake of DMHI – and the journey to DMHI – using the novel Smart Survey approach (Fleming, Peiris-John, et al., 2020; Peiris-John et al., 2020). There is very little available data on this topic and thus, this research helps to address this important gap in the literature. A further strength of this study is the combined use of observational data and self-report survey data to provide a more detailed understanding of which adolescents these resources reach *outside* of a controlled environment.

6.5 Limitations of the current study

The Youth19 survey was conducted between May and September 2019, marginally before the onset of the COVID19 pandemic. COVID19 and the quarantines being implemented to limit its spread are reported to have an adverse effect on mental health (Brooks et al., 2020; Serafini et al., 2020). As such, the mental health of participants' may have changed since data collection (Racine et al., 2020). Similarly, and considered a limitation of both the Youth19 survey and the current study, adolescents' use of digital technology as a source of health or mental health resources may also have changed since the onset of the COVID19 pandemic (e.g. Weale, 2020).

A limitation of this specific study is that these results come from just one study, as such, more research is needed to draw conclusions about real-world DMHI uptake among adolescents experiencing probable mental distress. Second, opt-in and access data only includes participants who used the hyperlink emailed or sent to them. We do not know if the participants accessed DMHI in different ways; for example, through search engines or apps, or importantly, using the help options provided on the business card distributed to participants (see Figure 6). We also do not know if any, or how many, participants opted-in but did not receive the resources, for example, due to incorrect entry of phone number or email address, firewalls, or being perceived as spam by the participant or their email account. These participants will have been counted as did opt-in but did not access.

Two limitations also arise due to the nature of the data that were provided. That is, data were provided as summary statistics, rather than raw participant scores (as detailed in 4.3.3 *Data Analysis*). First, this thesis was unable to assess for *unique* predictors of opt-in and access status. That is, it may be the case that the relationship between school decile and DHR access can be fully accounted for by deprivation. Second, demographic characteristics and probable mental distress status were examined as distinct categories in the current thesis, and the intersectionality of participants was not addressed; for example, it is possible that participants who are male and high deprivation and experience probable distress have different patterns of access. However, moderation analyses (e.g. gender by deprivation status) were not possible without raw participant scores.

6.6 Future research directions

Many new research areas emerge from the current thesis. First, drawing from the literature review and the data, I speculated about what factors may have shaped the current findings. However, given adolescents' rich understanding of their own experiences, qualitative follow-up studies may provide valuable data regarding why participants with probable mental distress did or did not opt-in, what was behind that decision, and their opinions regarding the visual and technical delivery of the resources.

Second, as addressed in *6.6 Limitations*, considering the intersection of different identities (e.g. probable distress, male, and high deprivation) in future research provides a more comprehensive understanding of which adolescents are interested and engaging in DMHI. Examining DMHI at such intersections may enable a more in-depth analysis of that specific groups' barriers to DMHI, their mental health needs, and their preferences.

Last, in response to the COVID19 pandemic, researchers have begun investigating changes in symptoms of mental distress among adolescents (Racine et al., 2020), what self-guided DMHI are effective to support people while social-distancing (Fischer et al., 2020), and how mental health services could use digital technology to better meet mental health needs (Moreno et al., 2020; Taylor et al., 2020). However, aside from media reports of increased helpline calls (Weale, 2020), it remains unclear whether adolescents' uptake of DMHI has changed during this time. Future research could investigate the changes that have occurred in adolescents' DMHI uptake since the onset of the COVID19 pandemic. This may help to shape mental health service delivery and digital help provision to better meet the needs of distressed adolescents in the current global context.

6.7 Conclusion

Adolescents have told us that they do use digital help options (Utter et al., 2017), they are interested in using DMHI following a survey (Peiris-John et al., 2020), and reports suggest that they are engaging with them autonomously (Health Promotion Agency, 2019; Youthline, 2019). Small to large positive improvements are reported in computerised psychotherapy controlled trials; however, more evidence is required to examine the mental health benefits that adolescents receive from digital psychoeducation and helplines (Ebert et al., 2015; Hollis et al., 2017). In this

thesis, I used Youth19 Smart Survey data to explore adolescents' journey to and uptake of DMHI in a real-world setting, with a particular focus on those experiencing probable mental distress.

I found that a substantial minority of participants were interested in receiving DHR (RQ1) whether they were experiencing mental distress or not (RQ2). Access to DHR was low, but interestingly, some groups – including those with probable mental distress – were more likely to access them. Due to the very low numbers of participants who accessed the DMHI, it was not appropriate to run statistical analyses, and thus, I was not able to determine whether participants experiencing probable distress were more likely to access DMHI than those who were not (RQ3). As such, I simply described them (RQ4).

The attrition reported between total participants, DHR opt-in, DHR access, and DMHI access in the current thesis is suggestive of a discrepancy between adolescents who are interested in and adolescents who access such resources in a real-world setting. Various factors, including *how* and *what* digital resources are offered, may have shaped these findings. Reflecting on these factors can help to inform future research direction and digital help provision.

The current findings, in sum, suggest that rather than framing DHR and DMHI as *the solution*, that it they should be considered *part of the solution*. Encouragingly, they may appeal to some adolescents who are experiencing probable mental distress. Multi-disciplinary research is required to ensure that DMHI are effective, engaging, equitable and can be successfully implemented into real-world, research and clinical settings.

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